HAWKER SIDDELEY

Safetran Systems

Railroad Signal Equipment

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Safetran

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Section A

Safetran

GRADE CROSSING WARNING

SECTION A

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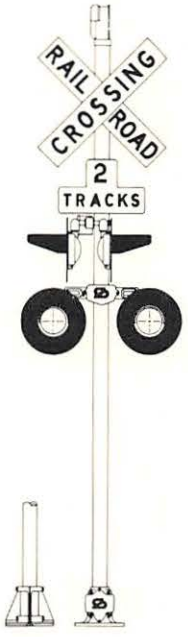
Safetran

FLASHING LIGHT SIGNAL ASSEMBLIES

Safetran Flashing Light Signal Assemblies are furnished with 4 or 5 inch aluminum mast and cast aluminum bases. Bases can be furnished in either the split base or junction box type. Mounting bolt spacing for the bases can be 9-1/2 x 9-1/2 inches or 11-11/16 x 11-11/16 inches. Signal units can be furnished with either the FLX-10 or FLX-12 flashing light units. One or two way indication assemblies with or without left and/or right sidelights are available. All components and assemblies meet applicable AAR specifications.



ORDERING INFORMATION

To Order: Specify the following:

1. Flashing Light Signal Assembly.
2. Base - either split or junction box type and bolt spacing. (See section A-9)
3. Light units - either FLX-10 (8-3/8 inch diamenter) or FLX-12 (12 inch diameter) and indication required (front, back, one way, two way, etc. See page A-7-2).
4. Roundel (See page A-7-3)
5. Bulb type (See page A-7-4)
6. Signs (See page A-1-2)
7. Bell - specify AC, DC, or AC-DC operation, loud or soft tone. (See Section A-8)
8. Specify 4 or 5 inch mast.

SIGNS FOR FLASHING LIGHT SIGNAL ASSEMBLIES

Safetran's low cost, long lasting signs are constructed of alloy aluminum. They are lightweight, easy to erect and maintain, and are corrosion resistant. The reflecting material, attached permanently to the sign face, has wide angle reflecting qualities that make the sign visible day or night.

All signs are black image on white background. All appropriate 4 or 5 inch mounting hardware is included in sign assemblies listed below.

To Order: Specify Description and Part Number.

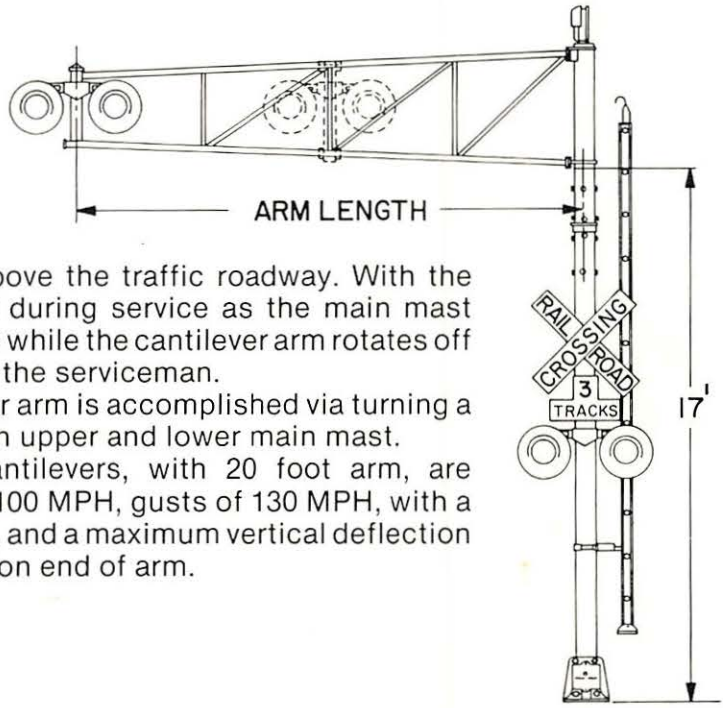
Description	Part Number (Mast Size)	
Railroad Crossing Sign	035200-3X (4 inch) 035200-12X (5 inch)	
Railway Crossing Sign	035201-3X (4 inch) 035201-10X (5 inch)	
Number of Tracks Sign (Specify # of Tracks)	035213-(#)X (4 inch) 035230-(#)X (5 inch)	

Safetran

CANTILEVERS

MODELS ARC-100, ANR-100, W, and WNR

MODEL ARC-100 ALUMINUM ROTATABLE CANTILEVER
MODEL ANR-100 ALUMINUM NON-ROTATABLE CANTILEVER



Models ARC-100 Aluminum Rotatable Cantilever and ANR-100 Cantilever assemblies provide mounting of warning devices for driver visibility both at the side and above the traffic roadway. With the ARC-100 this warning is uninterrupted during service as the main mast lights remain aligned to oncoming traffic while the cantilever arm rotates off the roadway, providing convenience for the serviceman.

Rotation of the ARC-100's cantilever arm is accomplished via turning a crank at the pivot head, located between upper and lower main mast.

Model ARC-100 and ANR-100 Cantilevers, with 20 foot arm, are designed to withstand wind velocity of 100 MPH, gusts of 130 MPH, with a maximum horizontal deflection of 3°-30', and a maximum vertical deflection of 7.7 inches with a load of 250 pounds on end of arm.

FEATURES

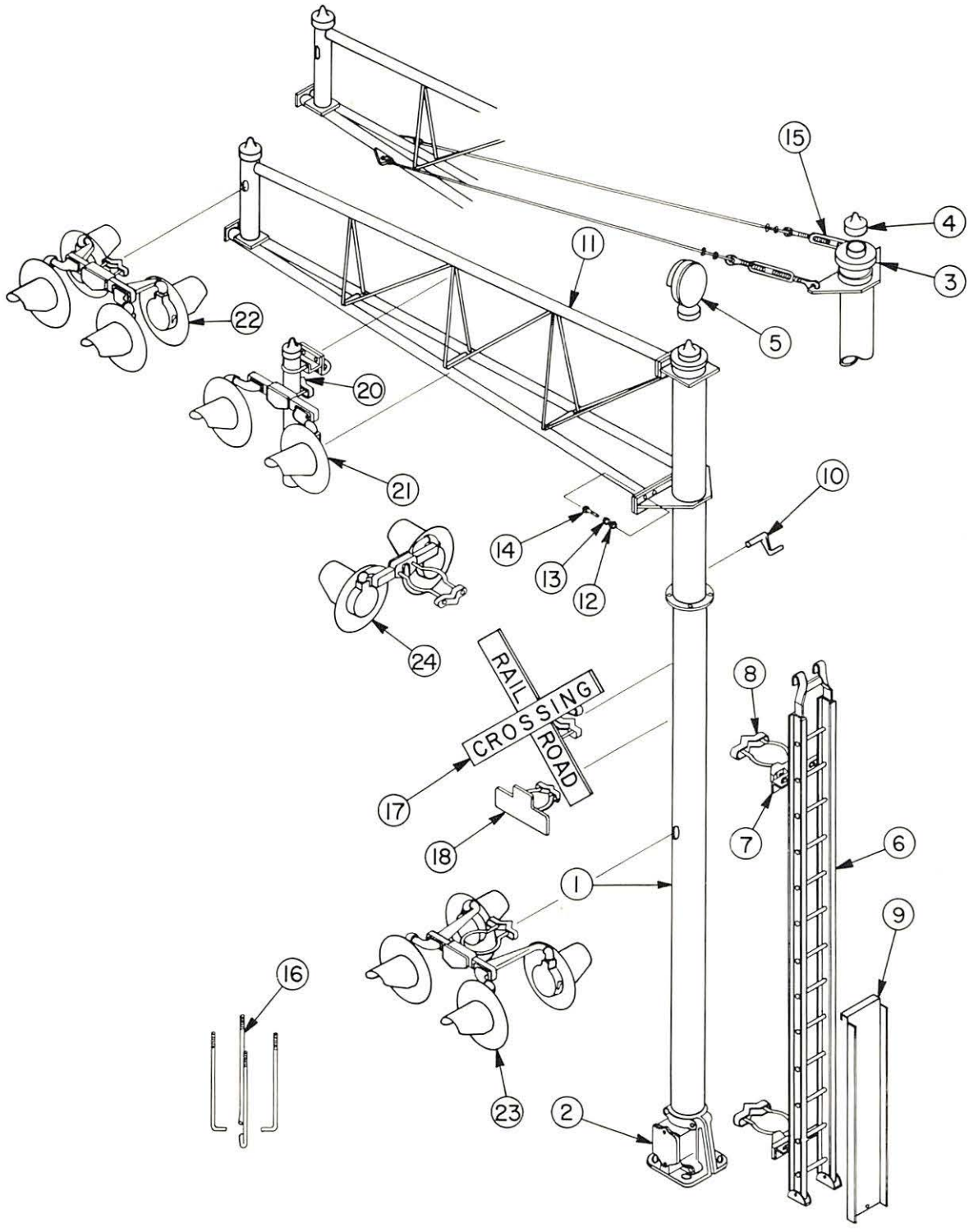
Mast - 8 inch aluminum pipe.
Base - Junction box case contains twelve terminals for wiring of warning devices. The base has slotted holes for easy mounting on 1 inch anchor bolts, arranged on 11-11/16 inch centers in a square pattern.
Arm - Available lengths of 6 to 26 feet have three 2 inch diameter main chord members.
Clearance - Main mast assemblies provide for 17 foot road clearance.
Bearings - Crank operated pivot head turns on maintenance free, permanently lubricated ball bearing assembly. (ARC only)

ORDERING INFORMATION

To Order: Specify the following:

1. ARC-100 or ANR-100 Aluminum Cantilever
2. Cantilever Arm Length (measured from center of main mast to center of jury mast)
3. Ladder (See page A-2-8)
4. Light Type (either FLX-10 or FLX-12), and location. (See section A-7)
5. Signs (See page A-2-4)
6. Anchor Bolts (See page A-2-3, item 16)
7. Bell - specify DC, AC, or AC-DC operation, and loud or soft tone (See section A-8)

MODEL ARC-100 AND ANR-100 ALUMININUM ROTATABLE CANTILEVER REPLACEMENT PARTS



To Order: Specify Description and Part Number

Item No.	Description	Part Number
1	ARC Mast, for 1 or 2 Way Main Flashing Lights, (includes item 2) Arm Lengths: 20' and under	071138-1X
	21'-26' (includes item 15)	071139-1X
	ANR Mast for 1 or 2 Way Main Flashing Lights, (includes item 2) Arm Lengths: 20' and under	071132-1X
	21'-26' (includes item 15)	071133-1X
2	Base, Junction Box	041919-X
3	Adapter, Pinnacle	035048-500X
4	Pinnacle	035045-503X
5	Bell, 4" mount (See section A-8)	Specify
6	Ladder, 18' - 6" (See page A-2-8)	071131-500X
7	Bracket, Ladder (2 required)	071515-1X
8	Saddle and Bolt Assembly (2 required)	042007-X
9	Guard, Ladder (12" x 77")	071352-3
10	Crank, Pivot Head (ARC Only)	071508
11	Arm, Cantilever (specify length), item 15 included for arms 21' - 26'	071104-(#)X
12	Nut, Hex, 3/4" - 10	2114-SC
13	Washer, Spring Lock, M, 3/4"	1810-MSC
14	Cap Screw, Hex Head, 3/4" - 10 x 2.5"	4276-HSC
15	Truss Assembly Kit (for arms 21' - 26')	071130-X
16	Anchor Bolt Assembly, 1" x 42", Hot Dipped Galvanized (includes 1 Anchor Bolt, Flat Washer, and Hex Nut) (4 required)	131702-11X
17	Sign, Railroad Crossing, Mast Mounted	035200-1X
18	Sign, Number of Tracks, Mast Mounted (specify # of tracks)	035209-(#)X
19	Sign, Stop On Red Signal (not shown)	035204-1X
20	Jury Mast, Lane Assembly (for 2 way - order 2 each) (includes mast mounting hardware)	071123-X
21	Flashing Lights, Arm Mounted, Lane, furnished with 20°/32° lens and 10V/18W bulb (See A-7-2)	
	FLX 10 1 way (for 2 way - order 2 each)	042003-000601
	FLX 12 1 way (for 2 way - order 2 each)	042003-000539
22	Flashing Lights, Arm Mounted, furnished with 20°/32° lens and 10V/18W bulb	
	FLX 10 1 way	042003-000601
	FLX 10 2 way	042003-000573
	FLX 12 1 way	042003-000539
	FLX 12 2 way	042003-000540
23	Flashing Lights, Mast Mounted, furnished with 30°/15° lens and 10V/18W bulb	
	FLX 10 1 way	042003-000575
	FLX 10 2 way	042003-000535
	FLX 12 1 way	042003-000580
	FLX 12 2 way	042003-000554
24	Flashing Lights, Side Mast Mounted, furnished with 30°/15° lens and 10V/18 bulb	
	FLX 10 1 way any angle left	042003-000575
	FLX 10 1 way any angle right	042003-000627
	FLX 10 2 way any angle left or right	042003-000581
	FLX 12 1 way any angle left	042003-000635
	FLX 12 1 way any angle right	042003-000632
	FLX-12 2 way any angle left or right	042003-000633

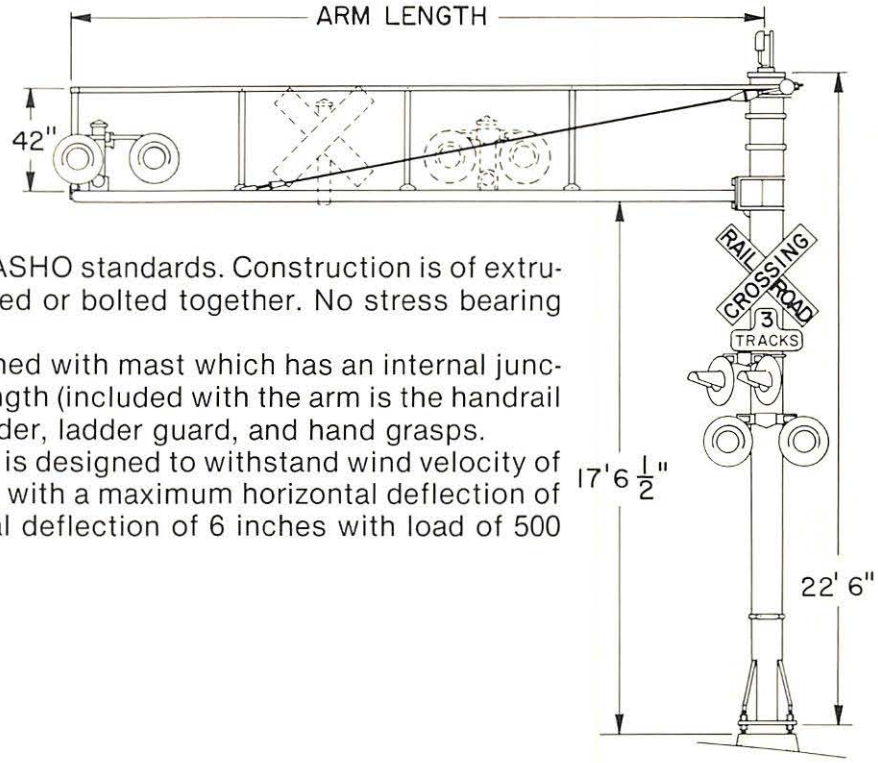
SIGNS FOR CANTILEVER SIGNALS

Safetran's low cost, long lasting signs are constructed of alloy aluminum. They are lightweight, easy to erect and maintain, and are corrosion-resistant. The reflecting material, attached permanently to the sign face, has wide angle reflecting qualities that make the sign visible day or night. All signs are black image on white background. All appropriate mounting hardware is included in the sign assemblies listed below.

To Order: Specify Description and Part Number.

Description	Part Number		
	8" Mounting (ARC and ANR)	12" Mounting (W and WNR)	
Railroad Crossing Sign (mast mounted)	035200-1X	035200-21X	
Railroad Crossing Sign (arm mounted)	071122-X	035200-56X	
Railway Crossing Sign (mast mounted)	035201-1X	035201-11X	
Railway Crossing Sign (arm mounted)	071122-1X	035201-12X	
Stop on Red Signal Sign (mast mounted)	035204-1X	035204-7X	
Number of Tracks Sign Specify # of Tracks	035209-#X	035239-#X	

WALKOUT CANTILEVER
MODEL W



Model W Walkout Cantilever is an all aluminum non-rotatable walkout type warning device support assembly with arm lengths of 12 to 26 feet. It is designed to satisfy AAR and AASHO standards. Construction is of extrusions, plates, and pipe welded or bolted together. No stress bearing castings are used.

The Cantilever is furnished with mast which has an internal junction box, arm of specified length (included with the arm is the handrail and walkway), jury mast, ladder, ladder guard, and hand grasps.

The Model W Cantilever is designed to withstand wind velocity of 100 MPH, gusts of 130 MPH, with a maximum horizontal deflection of 3°-15', and maximum vertical deflection of 6 inches with load of 500 pounds on end of arm.

FEATURES

Mast - 12-3/4 inch OD aluminum pipe, internal junction box with twelve binding posts for wiring of warning devices.

Base - Base plate is welded to mast and has slotted holes for easy mounting on 1-1/2 inch anchor bolts arranged on 19 inch centers in a square pattern.

Arm - Lengths of 12 to 20 feet have main chord members of 3-1/2 inch OD; 21 to 26 foot arms have main chord members of 4 inch OD.

Handrail - Designed to provide easy transfer from ladder to walkway, handrail is preassembled to arm at factory and shipped folded down.

Walkway - 20 inches wide, made of expanded metal to provide good footing, minimize wind load, and prevent ice/snow buildup.

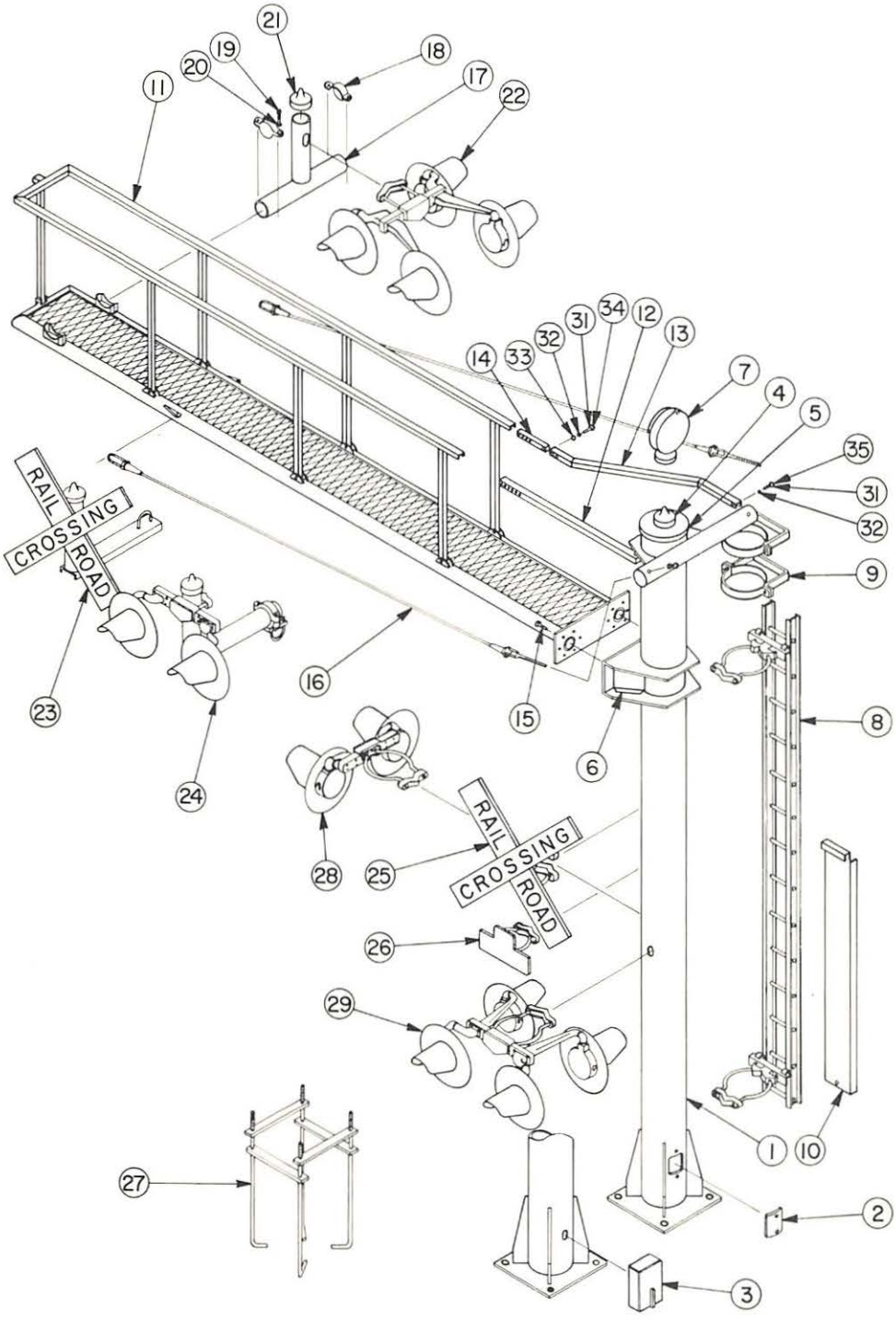
Light Units - Mounted near end of arm, outside of structure for ease of service and good visibility.

ORDERING INFORMATION

To Order: Specify the following:

1. Model W Walkout Cantilever
2. Cantilever Arm Length (measured from center of main mast to end of the arm)
3. Light Type (either FLX-10 or FLX-12), and location. (See section A-7)
4. Signs (See page A-2-4)
5. Anchor Bolts (See page A-2-7, item 27)
6. Bell - Specify DC, AC, or AC-DC operation, and loud or soft tone (See section A-8)

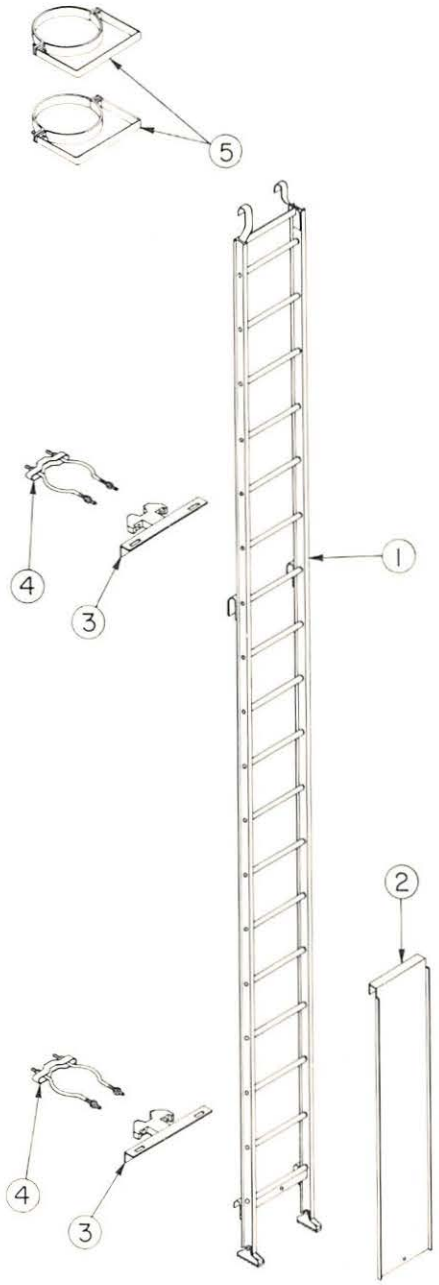
MODEL W WALKOUT CANTILEVER REPLACEMENT PARTS



Item No.	Description	Part Number
1	Mast 12" with Internal Junction Box (For 1 or 2 Way Main Flashing Lights)	
	Arm Lengths: 12' - 20'	071365-13028X
	Arm Lengths: 21' - 26'	071365-13033X
2	Cover, Terminal	071363-12X
3	Junction Box, External	151509-4X
4	Pinnacle	035045-503X
5	Adapter, Pinnacle	035062-X
6	Cover, Wire Chase	071313-4
7	Bell, 4" Mount (See Section A-8)	Specify
8	Ladder, 16" (See Page A-2-8)	071351-X
9	Grasps, Hand (2 req.'d)	071366-1X
10	Guard, Ladder (8-1/2" x 77")	071352-1
11	Cantilever Arm (Specify Length)	071373-(#)X
12	Handrail, Straight End	071330-31
13	Handrail, Curved Entrance	071329-32X
14	Sleeve Adjusting Anchor	071327-8
15	Hardware, Arm Mounting (Special High Strength)	
	Arms 12' - 20' (3/4"-10 x 3"), (8 req.'d)	071367-X
	Arms 21' - 26' (5/8"-11 x 3"), (12 req.'d)	071367-1X
16	Cable, Truss Arm Length 12' - 14'	071331-X
	15' - 16'	071331-1X
	17' - 19'	071331-2X
	20' - 23'	071331-3X
	24' - 26'	071331-4X
17	Mast, Jury	071343-23X
18	Casting, Aluminum Cap	071340-3
19	Cap Screw, Hex Head 1/2" - 13 x 4"	4178-HSC
20	Washer, Spring Lock, M, 1/2"	1812-MSC
21	Pinnacle	035045-503X
22	Flashing Lights, Arm Mounted, Furnished with 20°/32° lens, 10V/18W Bulb	
	FLX-10 1 Way	042003-000629
	FLX-10 2 Way	042003-000600
	FLX-12 1 Way	042003-000564
	FLX-12 2 Way	042003-000563
23	Railroad Crossing Sign, Arm Mounted	035200-56X
24	Flashing Lights, Lane, Arm Mounted Furnished with 20°/32° lens, 10V/18V Bulb	
	FLX-10 1 Way Mast	071343-25X
	Crossarm	042003-000601
	FLX-10 2 Way Mast	071343-26X
	Crossarm (2)	042003-000601
	FLX-12 1 Way Mast	071343-25X
	Crossarm	042003-000539
	FLX-12 2 Way Mast	071343-26X
	Crossarm (2)	042003-000539
25	Sign, Railroad Crossing, Mast Mounted	035200-21X
26	Sign, # Tracks, Mast Mounted (Specify # of Tracks)	035239-(#)X
27	Bolts, Anchor, 1-1/2" x 54" Hot Dipped, Galvanized (includes 4 Bolts, 8 Nuts, 8 Washers, 4 Spacer Bars)	131700-103X
28	Flashing Lights, Side Mast Mounted (indicate Location on Mast, 45° - 90° Left or Right) Refer to Item No. 29 for Ordering Numbers.	Specify
29	Flashing Lights, Mast Mounted, Furnished with 30°/15° Lens, 10V/18W Bulb	
	FLX-10 1 Way	042003-000545
	FLX-10 2 Way	042003-000553
	FLX-12 1 Way	042003-000606
	FLX-12 2 Way	042003-000607
30	Sign, Stop on Red Signal, Mast Mounted (not shown)	035204-7X
31	Washer, Wrought, 3/8"	1753C
32	Washer, Spring Lock, M, 3/8"	1810-MSC
33	Nut, Hex, 3/8"-16	2104-SC
34	Cap Screw, Hex Head, 3/8"-16 x 3"	4096-HSC
35	Cap Screw, Hex Head, 3/8"-16 x 2.75"	4095-HSC

LADDER ASSEMBLIES FOR CANTILEVER SIGNALS

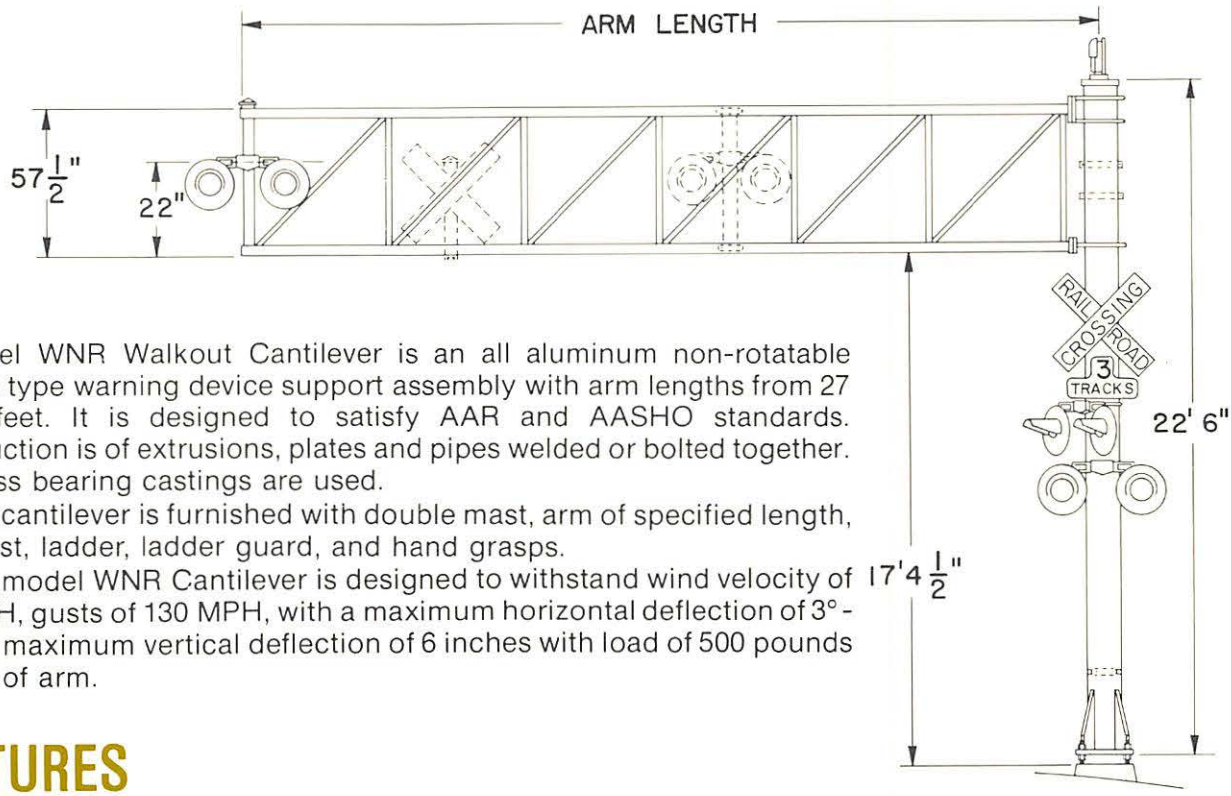
Safetran Aluminum Ladder Assemblies are made of high quality aluminum sides with ribbed rungs for improved traction. Each ladder is designed for use with cantilever assembly of 17 foot clearance. When not in service, the ARC and ANR Cantilever Ladder can be locked in ladder hanger assembly located on side of cantilever main mast. Both the W and WNR cantilever ladders are designed to be used in service in their ladder hanger assemblies, and can also be locked in their hanger assemblies on side of main mast.



Item No.	Description	Part Number	
		ARC and ANR Cantilever	W and WNR Cantilever
1	Ladder	071131-500X	071351-X
2	Guard, Ladder	071352-3	071352-1
3	Bracket, Ladder	071515-1X	071515-20X
4	Saddle and Bolt Assembly	042007-X	042007-2X
5	Hand Grasp		071366-1X

WALKOUT CANTILEVER

MODEL WNR



Model WNR Walkout Cantilever is an all aluminum non-rotatable walkout type warning device support assembly with arm lengths from 27 to 40 feet. It is designed to satisfy AAR and AASHO standards. Construction is of extrusions, plates and pipes welded or bolted together. No stress bearing castings are used.

The cantilever is furnished with double mast, arm of specified length, jury mast, ladder, ladder guard, and hand grasps.

The model WNR Cantilever is designed to withstand wind velocity of 100 MPH, gusts of 130 MPH, with a maximum horizontal deflection of 3° - 15' and maximum vertical deflection of 6 inches with load of 500 pounds on end of arm.

FEATURES

Mast - 2 aluminum 12-3/4 inch OD pipes, internal junction box with twelve binding posts for wiring of warning devices.

Base - Base plate is welded to both masts and has slotted holes for leveling on 1-1/2 inch anchor bolts.

Arm - Lengths of 27 to 40 feet (for shorter than 27 feet see page A-2-5), have main chord members of 3 inch OD. Walkway enclosure is 20 inches wide and 54 inches high.

Walkway - Made of expanded aluminum to provide good footing, minimize wind load, and to minimize ice/snow buildup.

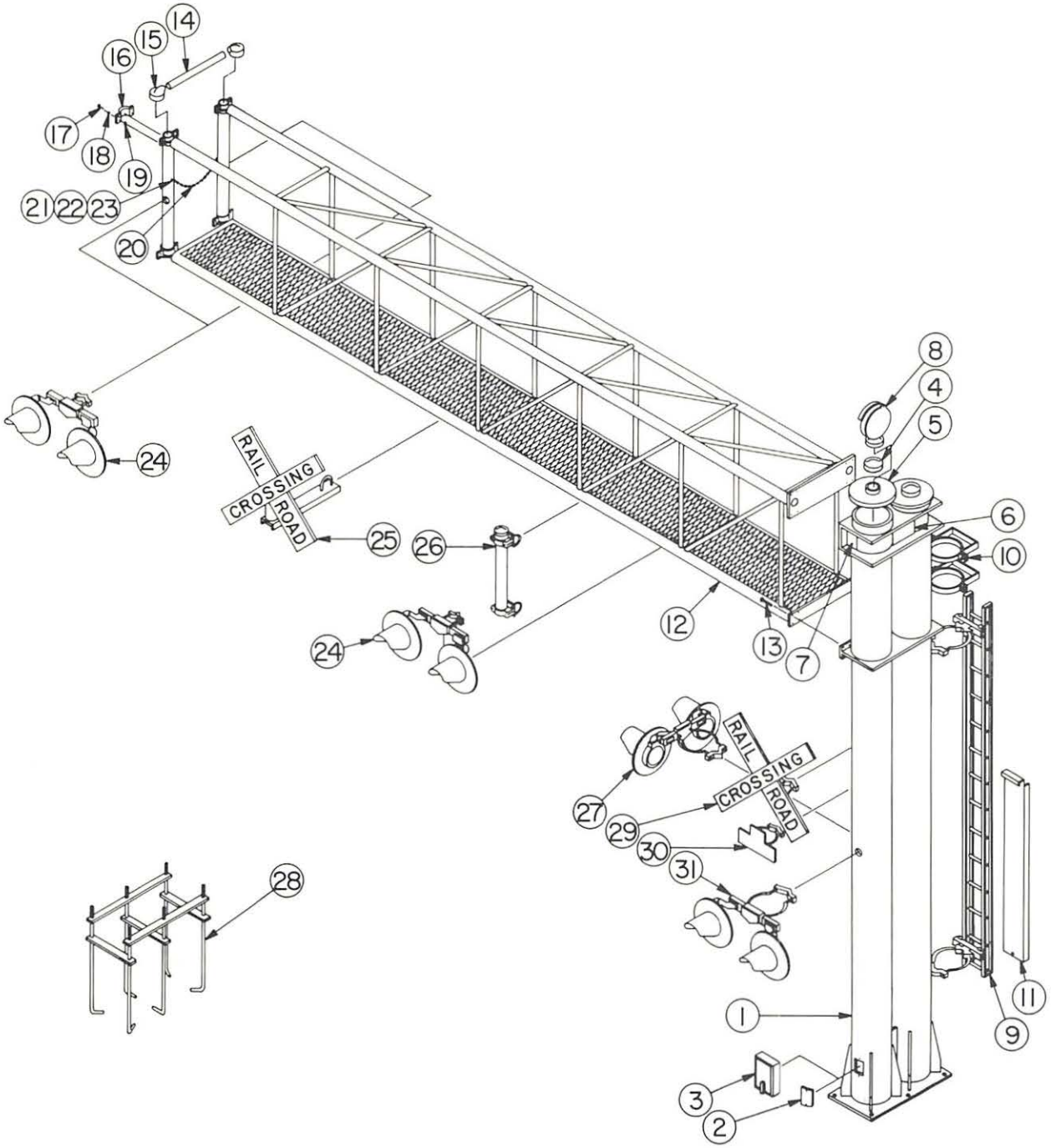
Light Units - Mounted at end of arm and outside of structure for ease of service and good visibility.

ORDERING INFORMATION

To Order: Specify the following:

1. Model WNR Walkout Cantilever
2. Cantilever Arm Length (measured from center of main mast to end of the arm).
3. Light Type (either FLX-10 or FLX-12), and location (See section A-7)
4. Signs (See page A-2-4)
5. Anchor Bolts (See page A-2-11, item 28)
6. Bell - Specify DC, AC, or AC-DC operation, and loud or soft tone. (See section A-8)

MODEL WNR WALKOUT CANTILEVER REPLACEMENT PARTS



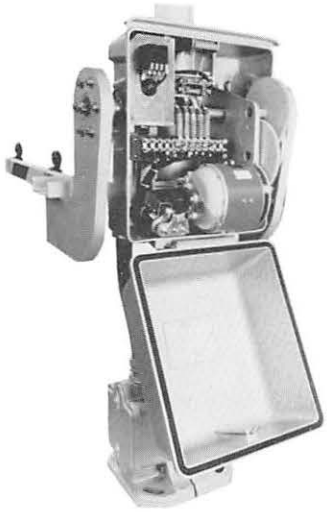
To Order: Specify Description and Part Number

Item No.	Description		Part Number
1	Mast, Double with Internal Junction Box, for one or two way main flashing lights Arm Lengths:		
	27' - 30'	1 way main flashing lights	070480-13016X
		2 way main flashing lights	070480-13017X
	31' - 40'	1 way main flashing lights	070480-13021X
		2 way main flashing lights	070480-13022X
2	Cover, Terminal		071363-12X
3	Junction Box, External		151509-4X
4	Pinnacle		035045-503X
5	Adapter, Pinnacle		035062-X
6	Cover, Wire Entry (1 required)		071313-4
7	Cover, Wire Entry (2 required)		071313-6
8	Bell, 4" Mount (See section A-7)		Specify
9	Ladder, 16' (See page A-2-8)		071351-X
10	Grasps, Hand		071366-1X
11	Guard, Ladder (8-1/2" x 77")		071352-1
12	Arm, Cantilever (specify length)		070475-(#)X
13	Hardware, Arm Mounting (Special High Strength) (3/4" - 10 x 3")		071367-6X
14	Pipe, Wiring		070484-4
15	Pinnacle, Wire Run		035044-501X
16	Clamp, Mast, 4"		071524-4
17	Cap Screw, Hex Head, 1/2" - 13 x 1.75"		4169-HSC
18	Washer, Spring Lock, M, 1/2"		1812-MSC
19	Nut, Hex, 1/2" - 13		2108-SC
20	Chain, Safety		071377-X
21	Cap Screw, Hex Head, 3/8" - 16 x 5.5"		4103-HSC
22	Washer, Wrought, 3/8"		1753-SC
23	Nut, Hex, 3/8" - 16		2323-SC
24	Flashing Lights, Arm Mounted, furnished with 20°/32° lens and 10V/18W bulb		
	FLX-10 (For 2 way - order 2 each)	1 way	042003-000601
	FLX-12 (For 2 way - order 2 each)	1 way	042003-000539
25	Sign, Railroad Crossing, Arm Mounted		035200-56X
26	Jury Mast, Lane Assembly (includes mounting hardware) (For 2 way - order 2 each)		070476-3X
27	Flashing Lights, Side Mast Mounted (indicate location on mast, 45° - 90° left or right) furnished with 30°/15° lens and 10V/18W bulb		
	FLX-10	1 way	042003-000545
	FLX-10	2 way	042003-000553
	FLX-12	1 way	042003-000606
	FLX-12	2 way	042003-000607
28	Bolt, Anchor Assembly, Hot Dipped Galvanized, 1-1/2" x 54" (includes 6 bolts, 12 nuts & washers, 5 spacer bars)		131700-108X
29	Sign, Railroad Crossing, Mast Mounted		035200-21X
30	Sign, Number of Tracks, Mast Mounted (Specify # of tracks)		035239-(#)X
31	Flashing Lights, Main Mast Mounted, furnished with 30°/15° lens and 10V/18W bulb. (For 2 way - order 2 each)		
	FLX-10	1 way	042003-000545
	FLX-12	1 way	042003-000606
32	Sign, Stop on Red Signal (not shown)		035204-7X

Safetran

RAILROAD HIGHWAY CROSSING GATE

MODEL S-20



- MEETS APPLICABLE AAR RECOMMENDED PRACTICES
- WEATHERPROOF LIGHTWEIGHT CAST ALUMINUM HOUSING
- EQUIPPED WITHSEALED, FACTORY LUBRICATED BEARINGS
- GRAVITY RELEASE RATCHET TYPE HOLD CLEAR

The Model S-20 Gate is an update of the Model S Gate that has served the railroad industry for over a half century. A newly designed Hold Clear with improved magnetics and mechanical latching is combined with the existing rugged 4 pole, series wound 12 volt motor. Steel gears mounted on sealed ball bearing shafts provide a smooth running 240 to 1 reduction gear train. Maintenance free sealed bearings are used with the gear shafts and the main shaft. A new rugged one piece permanent mold housing and gear frame is precision machined using C.N.C. (Computer Numerical Control).

This mechanism will operate the longest, properly counterbalanced gate arms smoothly and rapidly even when arms are covered with sleet.

During motor-up cycle, current consumption is 6-15 amperes. During the motor-down cycle, current consumption is 6-15 amperes. Operating voltage is 11-16 volts dc.

The hold-clear device, mounted on the end of the motor utilizes an over-running clutch which will latch the gate in the vertical position when energized. The hold-clear drops by gravity when de-energized. No electromagnetic brake is used. Holding the gate arm in the vertical position requires 35 milliamps at 12 volts.

Adjustable circuit controller cams are mounted on the shaft. Contact springs are mounted on a terminal board, forward in the assembly for ease of adjustment, inspection and maintenance.

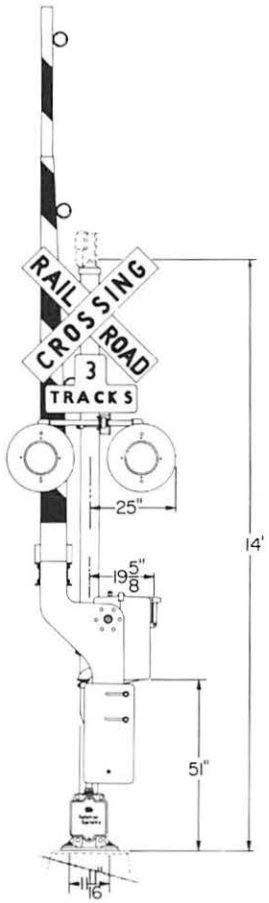
Cast aluminum gate arm supports are mounted on each end of the main shaft. They are adaptable for mounting of either wood or fiberglass gate arms.

Gate mechanism may be ordered with factory installed auxiliary shaft for application of sidewalk arm where required.

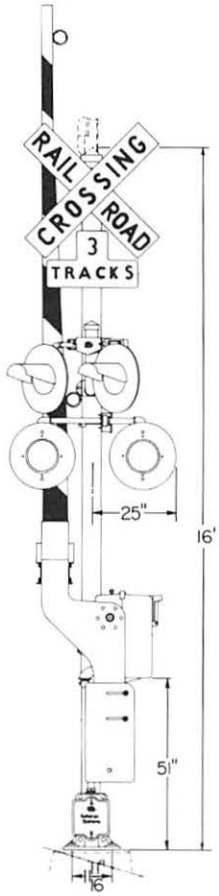
The cast cabinet is designed to mount directly on a five-inch mast, however, adapters can also be furnished for mounting on four- or eight-inch masts.

ORDERING INFORMATION

Type 50
S-20 Gate mounted on stub mast



Type 51
S-20 Gate with front and/or back flashing lights



Type 52
S-20 Gate with front and/or back flashing lights and cantilever mounted sidelights

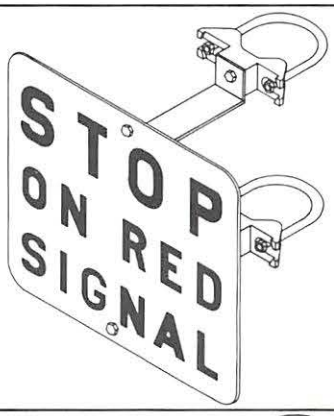
To Order: Specify the following:

1. Models S-20 Gate type, location of flashing lights and/or sidelights (specify one or two way), and if auxiliary arm is required.
2. FLX-10 or FLX-12 Flashing Lamp, lens type, and bulb type (See section A-7).
3. Bell, if desired, and type as follows: AC, DC, or AC-DC operation, loud or soft tone. (See section A-8) If bell is not ordered, pinnacle is provided.
4. Signs desired. (See page A-3-3)
5. Gate Arm type and length. (See section A-6)
6. If Auxiliary Arm is required, specify arm type and length.

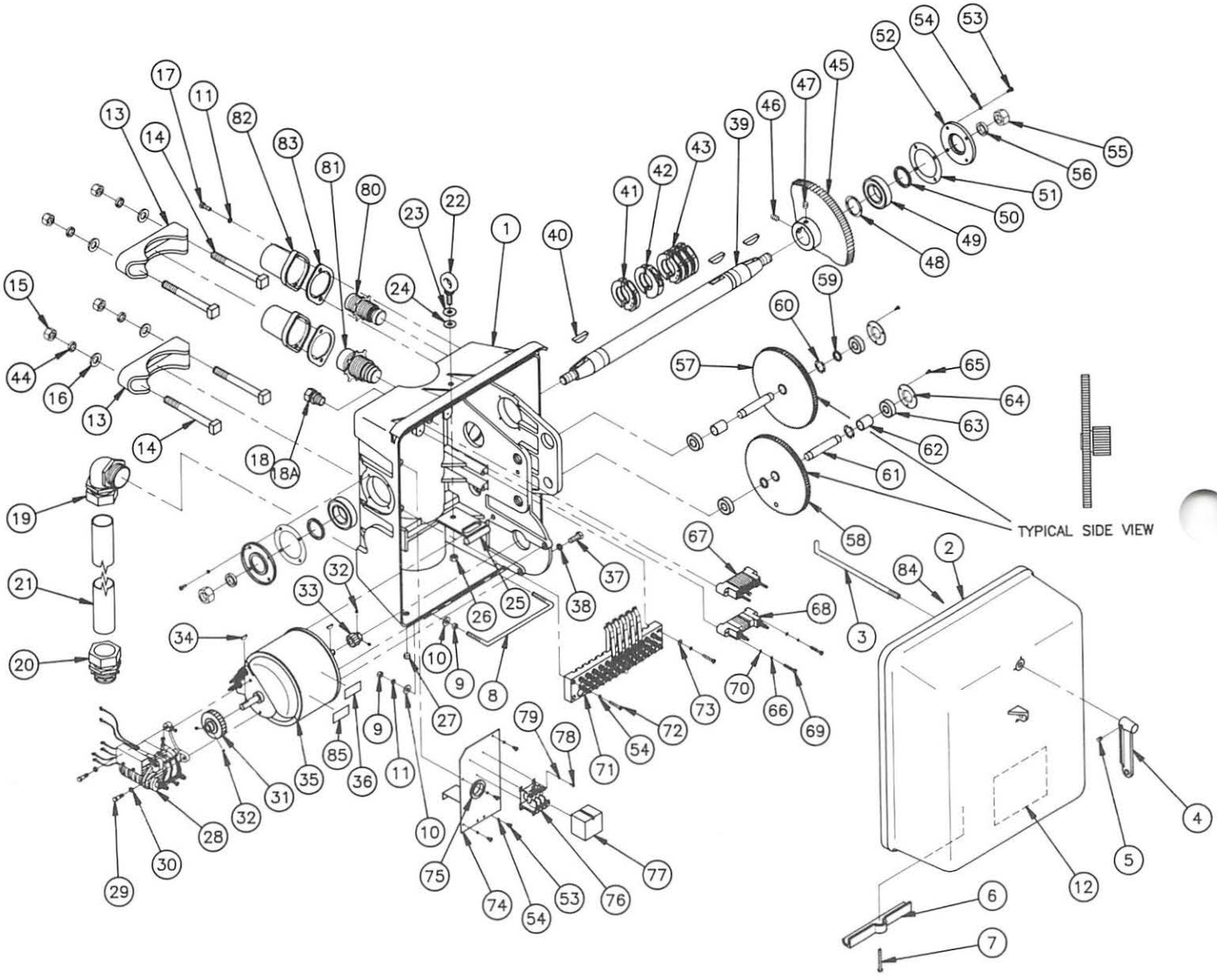
SIGNS FOR MODEL S-20 CROSSING GATE MAST MOUNTED

Safetran's low cost, long lasting signs are constructed of alloy aluminum. They are lightweight, easy to erect and maintain, and are corrosion resistant. The reflecting material, attached permanently to the sign face, has wide angle reflecting qualities that make the sign visible day or night. All signs are black image on white background. All appropriate 5 inch mounting hardware is included in the sign assemblies listed below.

To Order: Specify Description and Part Number.

Description	Part Number	
Railroad Crossing Sign		
Standard Reflecting Material	035200-17X	
High Intensity Reflecting Material	035200-17HBX	
Railway Crossing Sign		
Standard Reflecting Material	035241-4X	
High Intensity Reflecting Material	035241-4HBX	
Stop on Red Signal Sign		
Standard Reflecting Material	035204-5X	
High Intensity Reflecting Material	035204-5HX	
Number of Tracks Sign Specify # of Tracks		
Standard Reflecting Material	035236-#X	
High Intensity Reflecting Material	035236-#HX	

MODEL S-20 GATE MECHANISM ASSEMBLY

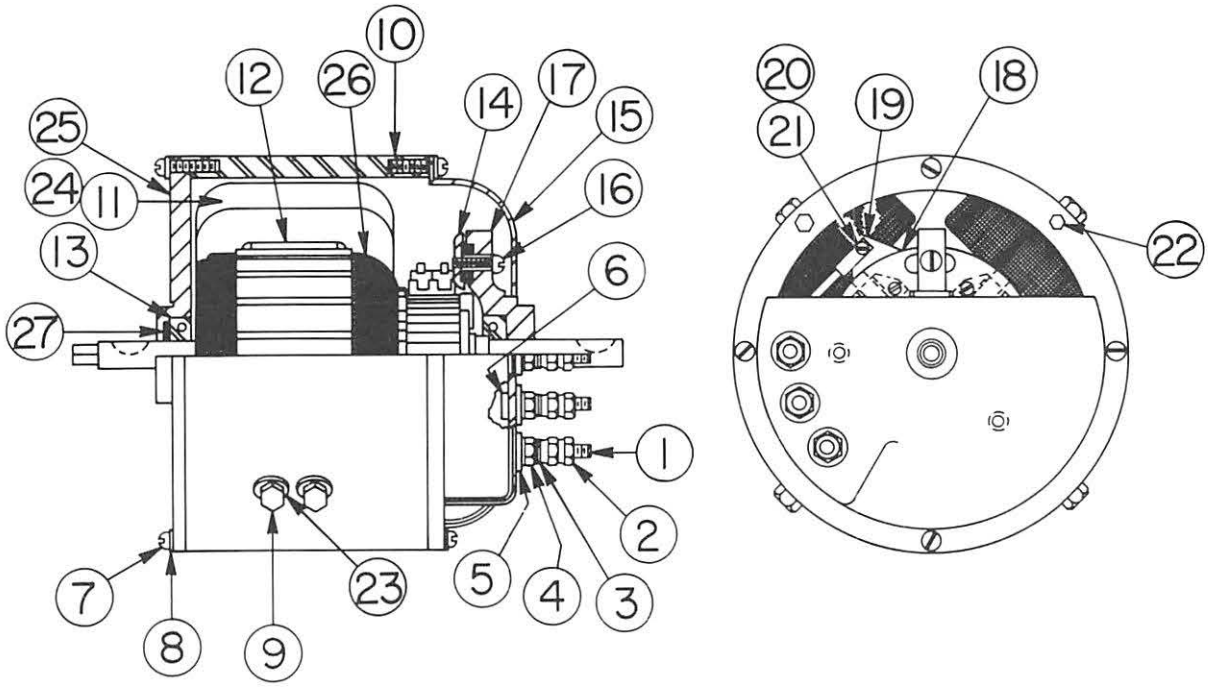


MODEL S-20 GATE MECHANISM REPLACEMENT PARTS

To Order: Specify Description and Part Number

Item No	Description	Qty Req'd	Part Number	Item No	Description	Qty Req'd	Part Number
1	Cabinet, Gate	1	073001-1	44	Washer Lock 3/4"	4	1815-MSC
2	Cover, Gate	1	073002-X	45	Gear Segment	1	073003
3	Latch Rod	1	070919-2	46	Set Screw, Socket 1/2" – 13 x 3/4"	1	4708-SC
4	Handle, Latch	1	070909-4				
5	Screw Set Socket Head 3/8" – 16 x 1/2"	1	7860-SC	47	Set Screw, Socket 1/2" – 13 x 1/2" (Over Key)	1	4706-SC
6	Hinge Retainer	1	070968-4	48	Retaining Ring	1	070584
7	Screw, Hex 5/16" – 18 x 2-1/2"	1	2692-HSC	49	Bearing	2	075284
8	Hinge Bolt	1	070968-2	50	O-Ring 2"	2	070585
9	Nut, Hex 3/8" – 16	4	2104-SC	51	Gasket, Seal Plate	2	070747-3
10	Washer, Flat 3/8" x 1 O.D.	2	1753-C	52	Seal Plate, Bearing	2	073008
11	Washer, Lock 3/8"	6	1810-MSC	53	Machine Screw Phil Pan Head 1/4" – 20 x 5/8"	12	2659-PSCX
12	Decal, Wiring	1	073000				
13	Casting, Aluminum Saddle	2	070950	54	Washer, Lock 1/4"	16	1808-MSC
14	Machine Bolt, Square 3/4" – 10 x 7.00"	4	8085-SC	55	Nut, Hex 1-1/4"	2	2119-SC
				56	Washer, Lock 1"	2	1817-MSC
15	Nut, Hex 3/4" – 10	4	2114-SC	57	Gear & Pinion Upper	1	073004
16	Washer, Flat 3/4"	4	1737-SC	58	Gear & Pinion Lower	1	073005
17	Screw, Hex Cap 3/8" – 16 x 1-1/4"	4	4089-HSC	59	Spacer 1/4"	2	073009-3
				60	Washer, Spring	2	070695-500
18	3/4" Connector 3/8" – 1/2" wire	1	7304-2	61	Shaft, Gear	2	073007-1
18A	3/4" Connector 5/8" – 3/4" wire	1	7354	62	Spacer 1-1/2"	2	073009-2
19	Connector, Elbow	1	070232	63	Ball Bearing	4	070588
20	Connector, Straight	1	070233	64	Cover, Bearing	2	073007-2
21	Conduit, Flexible	1	070692	65	Machine Screw Phil Truss Head #10 – 32 x 3/8"	6	2614-TSCX
22	Eye Bolt 1/2" – 13 x 1.50"	1	7099				
23	Washer, Flat 1/2"	1	1755-C	66	Washer, Lock #10	4	1806-MSC
24	Washer, Neoprene	1	070980-4	67	Resistor Adjustable 1.3 Ohm	1	029602-4BX
25	Latch Plate	1	070919-3X	68	Resistor Fixed .4 Ohm	1	029604-11X
26	Nut, Flexlock 1/2" – 13	1	2327-FLSC	69	Machine Screw Phil Pan Head #10 – 32 x 1.50"	4	2624-PSCX
27	Vent Bushing	2	041913-X				
28	Hold Clear Assembly	1	073100-X	70	Washer, Flat #10	4	1712-SC
29	Mounting Bolt	2	075084	71	Terminal Board Assembly	1	073010-X
30	Washer, Flat 5/16"	2	1752-C	72	Machine Screw Phil Pan Head 1/4" – 20 x 1-1/2"	4	2665-PEX
31	Ratchet Wheel Assembly	1	073111-X				
32	Set Screw, Socket 1/4" – 28 x 1/4"	4	4615-SC	73	Washer, Flat 1/4" x 5/8" O.D.	2	1717-SC
				74	Panel, Relay	1	073016
33	Pinion	1	070554-A	75	Grommet 2-1/8" O.D. x 1-1/2" I.D.	1	020616-23A
34	Woodruff Key #10	2	7101	76	Relay	1	070941-X
35	Motor Assembly 12 VDC	1	070640-3DX	77	Cover, Relay	1	070941-1
36	Tag, Warning	1	070980-2	78	Machine Screw Phil Pan Head #8 – 32 x 3/8"	3	2572-PSCX
37	Cap Screw, Hex 1/2" – 13 x 1-1/4"	3	4167-HSC				
				79	Washer, Lock #8	3	1805-MSC
38	Washer, Lock 1/2"	3	1812-MSC	80	Buffer Assembly Upper	1	070903-X
39	Shaft, Main	1	073006	81	Buffer Assembly Lower	1	070903-2X
40	Woodruff Key #UX	3	7149	82	Cap, Buffer	2	070902-1
41	Cam, Contact Assembly	1	070633-502X	83	Gasket, Buffer Cap	2	070926-1
42	Contact, Snap Switch Assembly	1	073014-1X	84	Gasket, Cover	1	070559-A
43	Cam, Contact Assembly	3	070633-AX	85	Label, Warning	1	070980-8

MOTOR ASSEMBLY AND REPLACEMENT PARTS

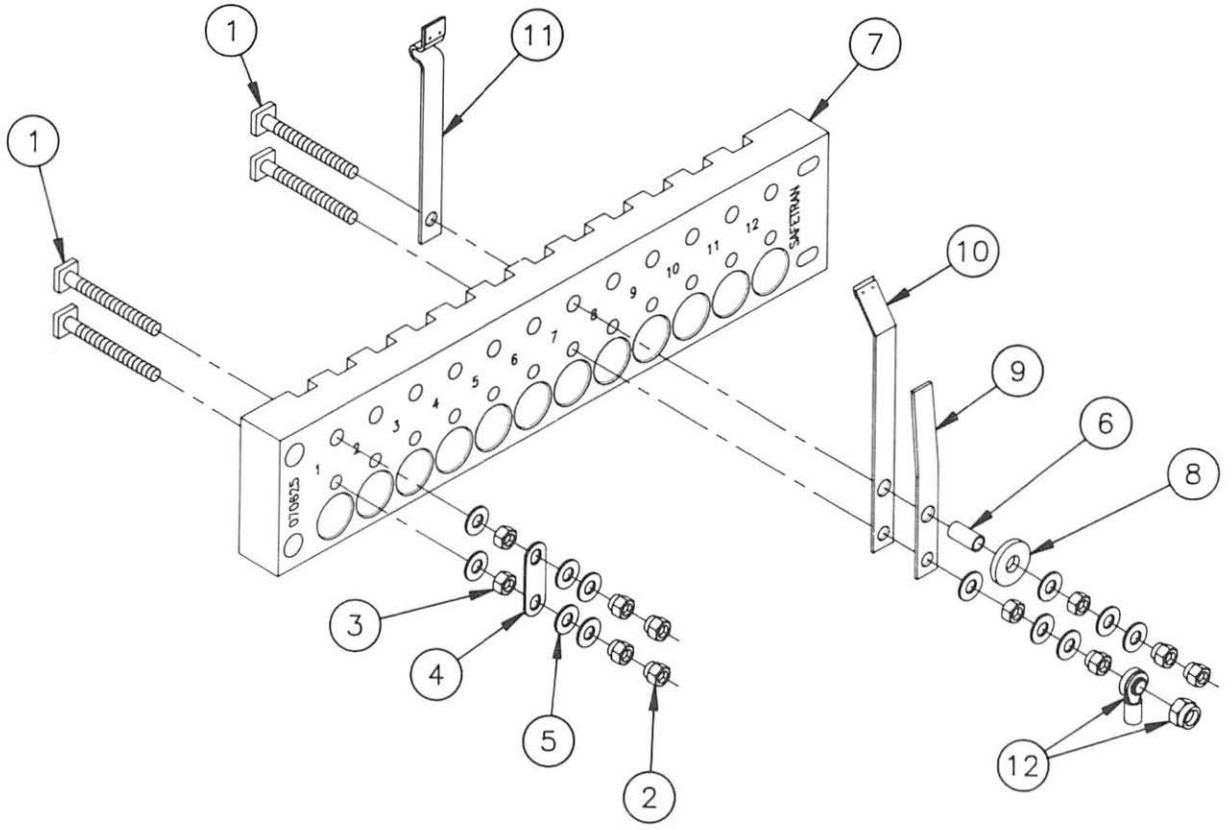


For Complete Assembly, Order Number 070640-3DX.

To Order: Specify Description and Part Number

Item No	Description	Qty Req'd	Part Number	Item No	Description	Qty Req'd	Part Number
1	Post, Binding	3	023833	15	Cover, End Motor	1	075119
2	Nut, Binding	6	023831	16	Machine Screw, Fillister Head, 1/4" – 20 x .75"	1	2662-LSN
3	Washer, Beveled	15	023834				
4	Nut, Clamp	3	023832	17	End, Motor (Rear)	1	075118-2
5	Insulator, Lower	6	075123-1	18	Bracket, Assembly	1	075111-X
6	Insulator, Upper	3	075124-1	19	Brush, Motor Assembly	4	075116-
7	Machine Screw, Fillister Head, 1/4" – 20 x 1"	8	2660-LBN	20	Machine Screw, Round Head, #6 – 32 x .500"	6	2559-RBN
8	Washer, Kant Link Lock, 1/4"	1	1808-QSC	21	Washer, Cut, #6S	2	1704-B
9	Cap Screw, Hex Head, 3/8" – 16 x 1"	8	4088-HSC	22	Machine Screw, Hex Head, #10 – 24 x .25"	2	2589-HSC
10	Housing, Motor	1	075120	23	Washer, Shakeproof Lock, I, 3/8"	8	1860-ISC
11	Coil, Field Assembly	1	075178-X	24	Tape, Insulator	8	075133-1
12	Pole, Field Assembly	1	075108-X	25	End, Motor	1	070689-7
13	Bearing, Ball	2	075142	26	Armature, Assembly	1	070682-BX
14	Clamp, Bracket	1	075117	27	Spacer	1	070695-500

TERMINAL BOARD ASSEMBLY AND REPLACEMENT PARTS

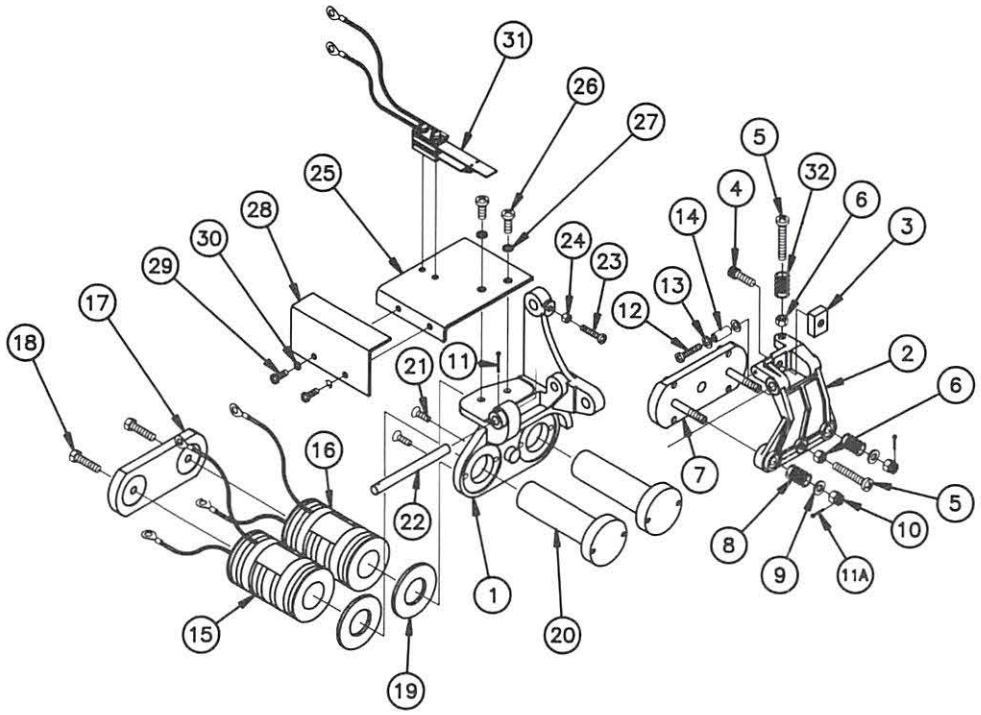


For Complete Assembly, Order Number 070625-6X.

To Order: Specify Description and Part Number

Item No.	Description	Qty Req'd	Part Number
1	Terminal Post	24	010427-6
2	Nut, Binding	47	023831
3	Nut, Clamp	24	023832
4	Connector	5	023839-2
5	Washer, Beveled	72	023834
6	Bushing, Insulating	5	041414
7	Terminal Board	1	070625
8	Washer, Insulating	5	070627
9	Spring, Reinforcing	5	073012-2
10	Contact, Fixed	5	073012-X
11	Contact, Movable	5	073011-X
12	Eyelet, Test Assembly	1	024628-1X

HOLD CLEAR ASSEMBLY AND REPLACEMENT PARTS



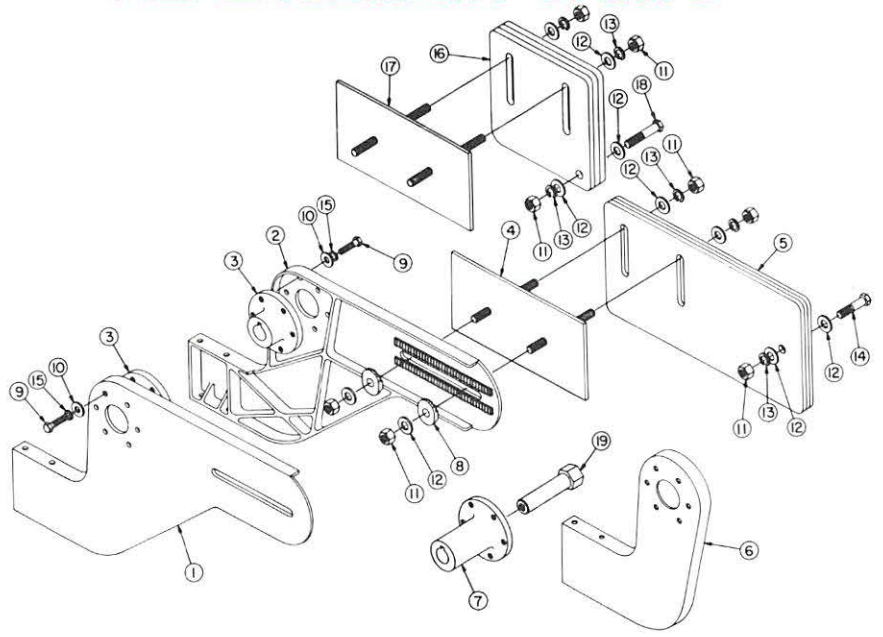
To Order: Specify Description and Part Number

Item No	Description	Qty Req'd	Part Number	Item No	Description	Qty Req'd	Part Number
1	Hold Clear Frame	1	073100-1	17	Yoke	1	073104-1
2	Armature Bracket	1	073102	18	Cap Screw, Hex Head, 1/4" – 20 x 1"	2	4004-HE
3	Pawl, Hold Clear	1	073102-2				
4	Cap Screw, Socket Head, 1/4" – 28 x 3/4"	1	4023-SSJ	19	Cushion Spacer	2	073100-2
				20	Core	2	073103-1
5	Machine Screw, Phil Pan Head, 1/4" – 20 x 1-1/2"	2	2665-PEX	21	Cap Screw, Flat Socket Head 10 – 32 x 5/8"	4	7747-YE
6	Nut 1/4" – 20" Hex	2	2100-E	22	Pivot Pin	1	073100-3
7	Armature, Assembly	1	073105-X	23	Machine Screw, Phil Pan Head, 10 – 32 x 3/4"	1	2619-PEX
8	Spring, Compression	2	070651				
9	Washer, Shoulder	2	1978-F	24	Nut Hex 10 – 32	1	2015-E
10	Nut Hex Castle 1/4" – 28	2	2494-SN	25	Contact Shelf	1	073106
11	Cotter Pin 1/16" x 3/4"	1	1001-SC	26	Machine Screw, Phil Pan Head, 1/4 – 20 x 5/8"	2	2659-PSCX
11A	Cotter Pin 1/16" x 1/2"	2	1000-SC				
12	Machine Screw, Phil Pan Head, 10 – 32" x 1-1/4"	1	2623-PSCX	27	Lock Washer 1/4"	2	1808-ME
				28	Contact Guard	1	073107
13	Washer, Nylon	2	010219-5	29	Machine Screw, Phil Pan Head, 10 – 32 x 1/2"	2	2616-PSCX
14	Actuator, Hold Clear	1	073102-3				
15	Coil Assy Hold Clear	1	073108-1X	30	Lock Washer #10	2	1806-ME
16	Coil Assy Pick Up	1	073108-X	31	Power Down Cont. Assy	1	070777-2AXY

For Complete Assembly, Order Number 073100-X.

For Complete Assembly with Ratchet Wheel and Mounting Hardware, Order Number 073100-1X.

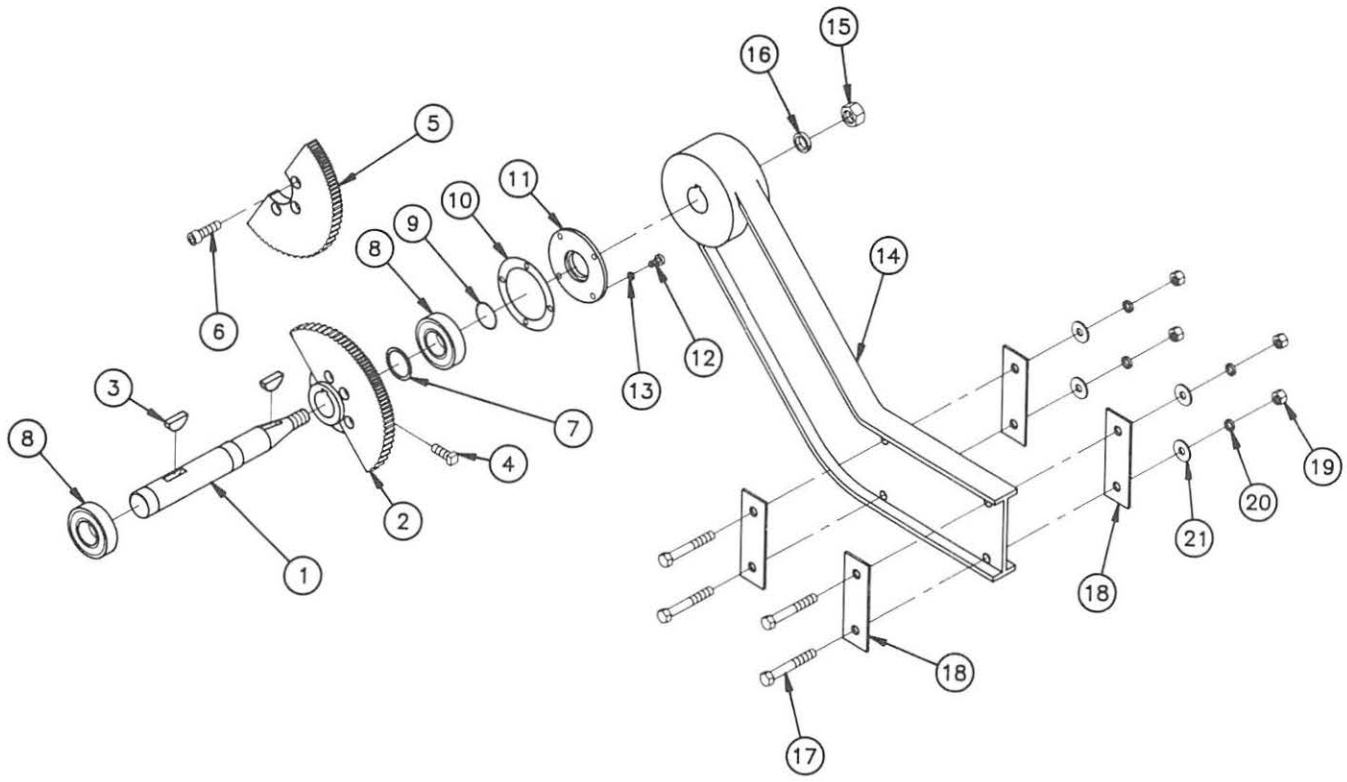
GATE ARM SUPPORTS/COUNTERWEIGHTS REPLACEMENT PARTS



To Order: Specify Description and Part Number

Item No	Description	Part Number
1	Support, Left Hand Support, Left Hand with Hub and Mounting Bolts	070920-L 070920-LX
2	Support, Right Hand Support, Right Hand with Hub and Mounting Bolts	070920-R 070920-RX
3	Hub, Gate Arm Support	070923-3
4	Plate, Stud for wood arms 13' – 36' and all fiberglass arms (standard) Plate, Stud for wood arms 37' – 42' (standard)	070757-26X 070757-24X
5	Counterweight, Steel, 1/2" x 15" x 30", 63 lbs (standard)	070755-4
6	Support, Left Hand for use without counterweights Support, LH w/o counterweights with Hub and Mounting Bolts	070921-L 070921-LX
6A	Support, Right Hand (not shown) w/o counterweights Support, RH w/o counterweights with Hub and Mounting Bolts	070921-R 070921-RX
7	Hub, Extended (for sidewalk arms)	070575-1X
8	Ratchet, Counterweight Bolt	070924
9	Cap Screw, Hex Head, 1/2" – 13 x 1.25"	4167-HSC
10	Washer, Wrought, 1/2"	1755-C
11	Nut, Hex, 3/4" – 10	2114-SC
12	Washer, Wrought, 3/4"	1737-SC
13	Washer, Spring Lock, M, 3/4"	1815-MSC
14	Cap Screw, Hex Head, 3/4" – 10 x 2" for 1 – 2 standard counterweights Cap Screw, Hex Head, 3/4" – 10 x 3" for 3 – 4 standard counterweights Cap Screw, Hex Head, 3/4" – 10 x 4" for 5 – 6 standard counterweights Machine Bolt, Hex Head, 3/4" – 10 x 6.5" for 7 – 10 standard counterweights	4274-HSC 4278-HSC 4282-HSC 3177-SC
15	Washer, Spring Lock, M, 1/2"	1812-MSC
16	Counterweight, Steel, 5/8" x 15" x 15", 38 lbs (short)	070755-34
17	Plate, Stud for wood arms to 36' and all fiberglass arms (short) Plate, Stud for wood arms 37' – 46' (short)	070757-30X 070757-31X
18	Cap Screw, Hex Head, 3/4" – 10 x 2.5" for 1 – 3 short counterweights Cap Screw, Hex Head, 3/4" – 10 x 5" for 4 – 6 short counterweights Machine Bolt, Hex Head, 3/4" – 10 x 8" for 7 – 11 short counterweights Machine Bolt, Hex Head, 3/4" – 10 x 14" for 12 – 21 short counterweights	4276-HSC 4284-HSC 3180-SC 3190-SC
19	Nut, Extended (for sidewalk arms)	070579

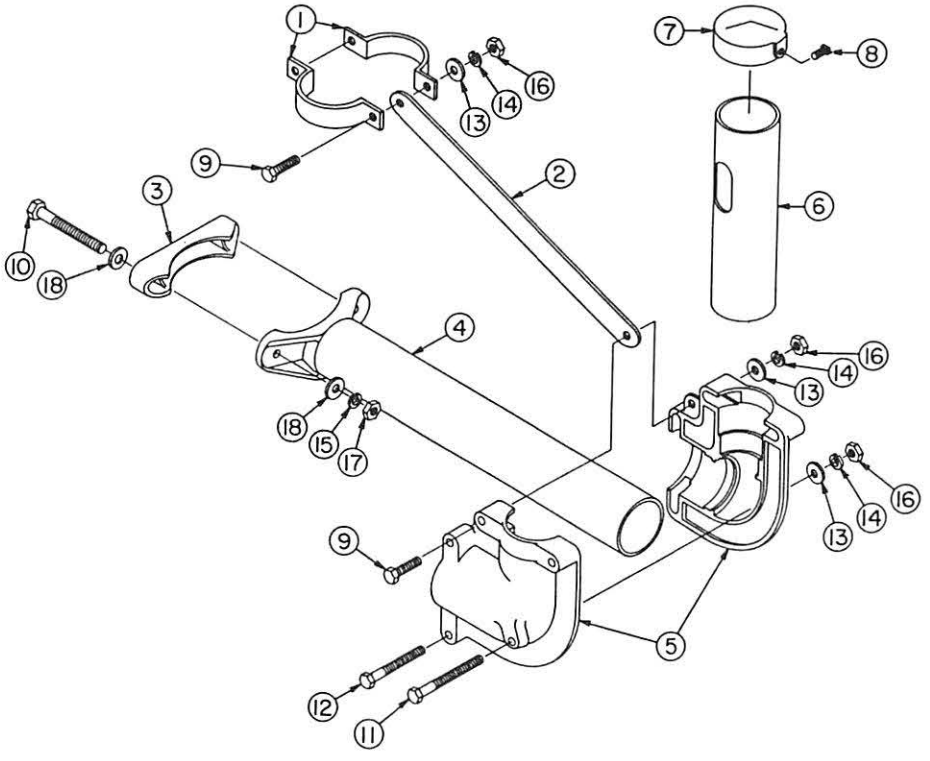
AUXILIARY SHAFT AND SUPPORT FOR SIDEWALK ARMS REPLACEMENT PARTS



To Order: Specify Description and Part Number

Item No	Description	Qty Req'd	Part Number	Item No	Description	Qty Req'd	Part Number
1	Shaft, Sidewalk Arm	1	073020	11	Seal Plate	1	073024
2	Gear Assembly, Sidewalk Arm	1	070569-AX	12	Machine Screw, Phil Pan Head 1/4" – 20 x 5/8"	4	2659-PSCX
3	Woodruff Key #D	2	7102	13	Washer, Lock 1/4"	4	1808-MSC
4	Set Screw, Square Head 3/8" – 16 x 1.25"	2	4933-SC	14	Support, Sidewalk Arm	1	070759-1X
				15	Nut, Hex 5/8" – 18	1	2113-SC
5	Gear, Bottom	1	070569-1A	16	Washer, Lock 5/8"	1	1814-MSC
6	Cap Screw, Socket Head 3/8" – 16 x 1.25" Locking	3	4089-2	17	Cap Screw, Hex Head 3/8" – 16 x 2.75"	4	4095-HSC
7	Retaining Ring	1	073021	18	Plate, Washer	4	070763-1
8	Bearing	2	073022	19	Nut, Hex 3/8" – 16"	4	2104-SC
9	O-Ring 1-3/16" I.D.	1	073023	20	Washer, Lock	4	1810-MSC
10	Gasket, Seal Plate	1	073025	21	Washer, Flat 3/8"	4	1753-C

SIDELIGHT CANTILEVER ASSEMBLY AND REPLACEMENT PARTS



For Complete Assembly, Order Number 041442-26X

To Order: Specify Description and Part Number

Item No.	Description	Qty Req'd	Part Number
1	Clamp, Pipe, 5"	2	035015-A
2	Bar, Support	1	041442-30
3	Casting, Aluminum Clamp	1	070950
4	Pipe, Lower	1	041442-25X
5	Casting, Aluminum Elbow	2	041442-26
6	Pipe, Upper	1	041442-29
7	Pinnacle, 4" – 5"	1	035045-502
8	Set Screw, Square Head, 3/8" – 16 x 1"	1	4932-SC
9	Cap Screw, Hex Head, 1/2" – 13 x 2"	3	4170-HSC
10	Cap Screw, Hex Head, 3/4" – 10 x 6"	2	4286-HSC
11	Cap Screw, Hex Head, 1/2" – 13 x 6"	1	4182-HSC
12	Cap Screw, Hex Head, 1/2" – 13 x 5"	4	4180-HSC
13	Washer, Wrought, 1/2"	8	1755-C
14	Washer, Spring Lock, M, 1/2"	8	1812-MSC
15	Washer, Spring Lock, M, 3/4"	8	1815-MSC
16	Nut, Hex, 1/2" – 13	8	2108-SC
17	Nut, Hex, 3/4" – 10	2	2114-SC
18	Washer, Flat, 3/4"	4	1737-SC

TORQUE WRENCH KIT

- Torque Wrench (ft - lb and in - lb readings)
- Ratcheting box end wrench (1/2 and 9/16 inches)
- Socket (1/2 inch, 3/8 inch drive)
- Allen Wrench (3/16 inch)
- Tool Box
- Ratchet Wrench (3/8 inch drive)
- Instruction Sheet

Safetran's optional Torque Wrench Kit permits horizontal and vertical torque adjustments and measurements to be taken from the 1/2 inch hexagon end of the motor shaft on the Models S-20, S, and SM Railroad Highway Crossing Gates, and on the Model SMB Industrial Gate. It provides a simpler method than the conventional manner with a spring scale for both measurements and adjustments.

The Torque Adapter which is only used with older model gates before 1977 provides for torque adjustments. The adapter consists of a hex shaft made onto a collar which fits over the end of the motor pinion, and is held in place by a set screw. Torque Adapter, 070554-2X, must be ordered separately.

The Torque Wrench Kit allows the gate arm to be cranked up, or in the case where the arm has been sheared off, to crank the weights to the horizontal position.

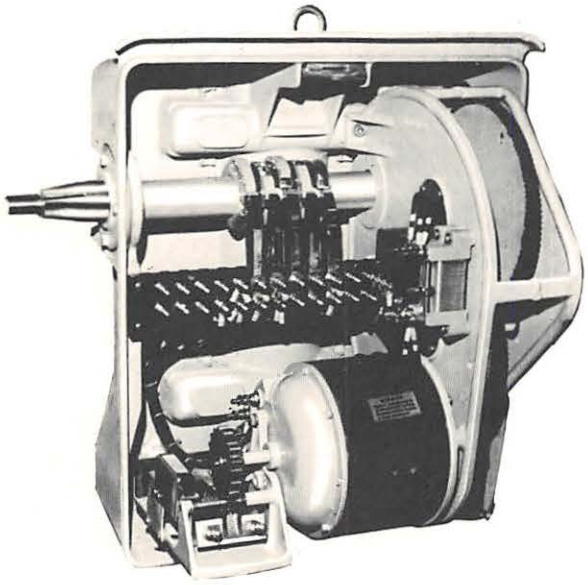
ORDERING INFORMATION

To Order: Specify Safetran Torque Wrench Kit and Part Number 070981-X.
For Torque Adapter only, order Part Number 070554-2X

Safetran

RAILROAD HIGHWAY CROSSING GATE

MODEL S



- MEETS APPLICABLE AAR SPECIFICATIONS
- WEATHERPROOF LIGHTWEIGHT CAST ALUMINUM HOUSING
- EQUIPPED WITH SEALED, FACTORY LUBRICATED BEARINGS
- GRAVITY RELEASE RATCHET TYPE HOLD CLEAR

The Model S Gate has served the railroad industry for over half of a century. It has a cast aluminum housing and cover. Steel gears mounted on the ball bearing shafts provide a smooth running 240 to 1 reduction gear train. Sealed ball bearings on these shafts are factory lubricated and require no further maintenance.

The mechanism is powered by a 12 VDC series motor designed and built for this mechanism to operate the longest, properly counterbalanced gate arms smoothly and rapidly.

During motor-up cycle, current consumption is 6 - 15 amperes. During the motor-down cycle, current consumption is 6 - 15 amperes. Both cycles require an applied voltage of not less than 11 volts at the motor terminals.

Holding the gate arm in the vertical position requires 34 milliamps at 12 volts.

Adjustable circuit controller cams are mounted on the shaft. Contact springs are mounted on a terminal board, forward in the assembly for ease of adjustment, inspection, and maintenance.

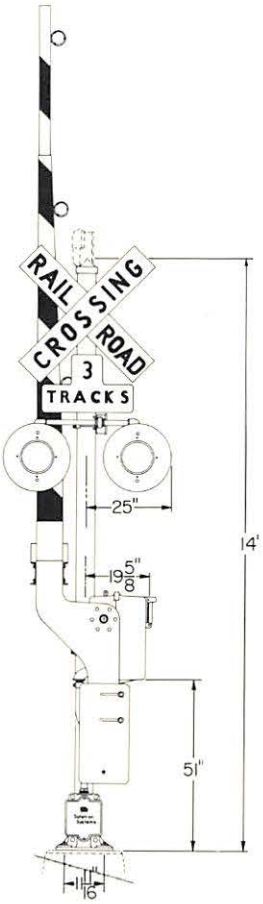
Cast aluminum gate arm supports are mounted on each end of the main shaft. They are adaptable for mounting of either wood, fiberglass, or fiberglass/aluminum gate arms.

Gate mechanism may be ordered with factory installed auxiliary shaft, for application of sidewalk arm when required.

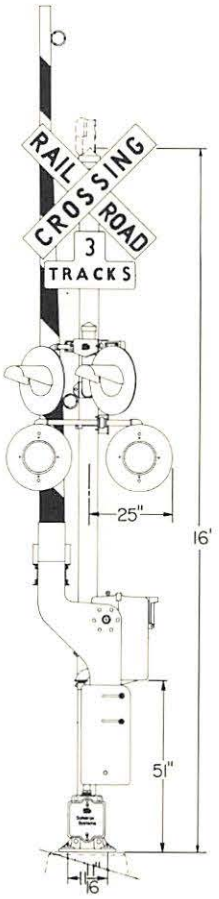
The cabinet is designed to mount directly on a five inch mast, however, adapters can also be furnished for mounting on four or eight inch masts.

ORDERING INFORMATION

Type 50
Stub Mast



Type 51
With Front or Front and Back Lights



Type 52
With Front, Front and Back Lights, with one or two way Sidelights

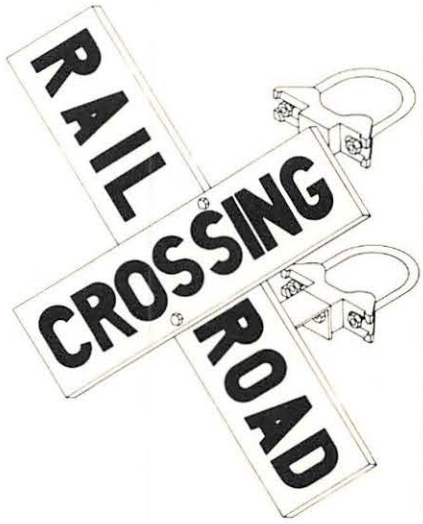
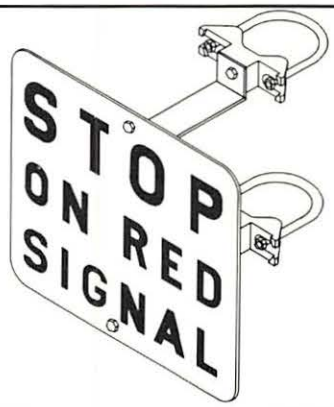
To Order: Specify the following:

1. Models S Gate type, location of flashing lights and/or sidelights (specify one or two way), and if auxiliary arm is required.
2. FLX-10 or FLX-12 Flashing Lamp, lens type, and bulb type (See section A-7).
3. Bell, if desired, and type as follows: AC, DC, or AC-DC operation, loud or soft tone. (See section A-8) If bell is not ordered, pinnacle is provided.
4. Signs desired. (See page A-3-3)
5. Gate Arm type and length. (See section A-6)
6. If Auxiliary Arm is required, specify arm type and length.

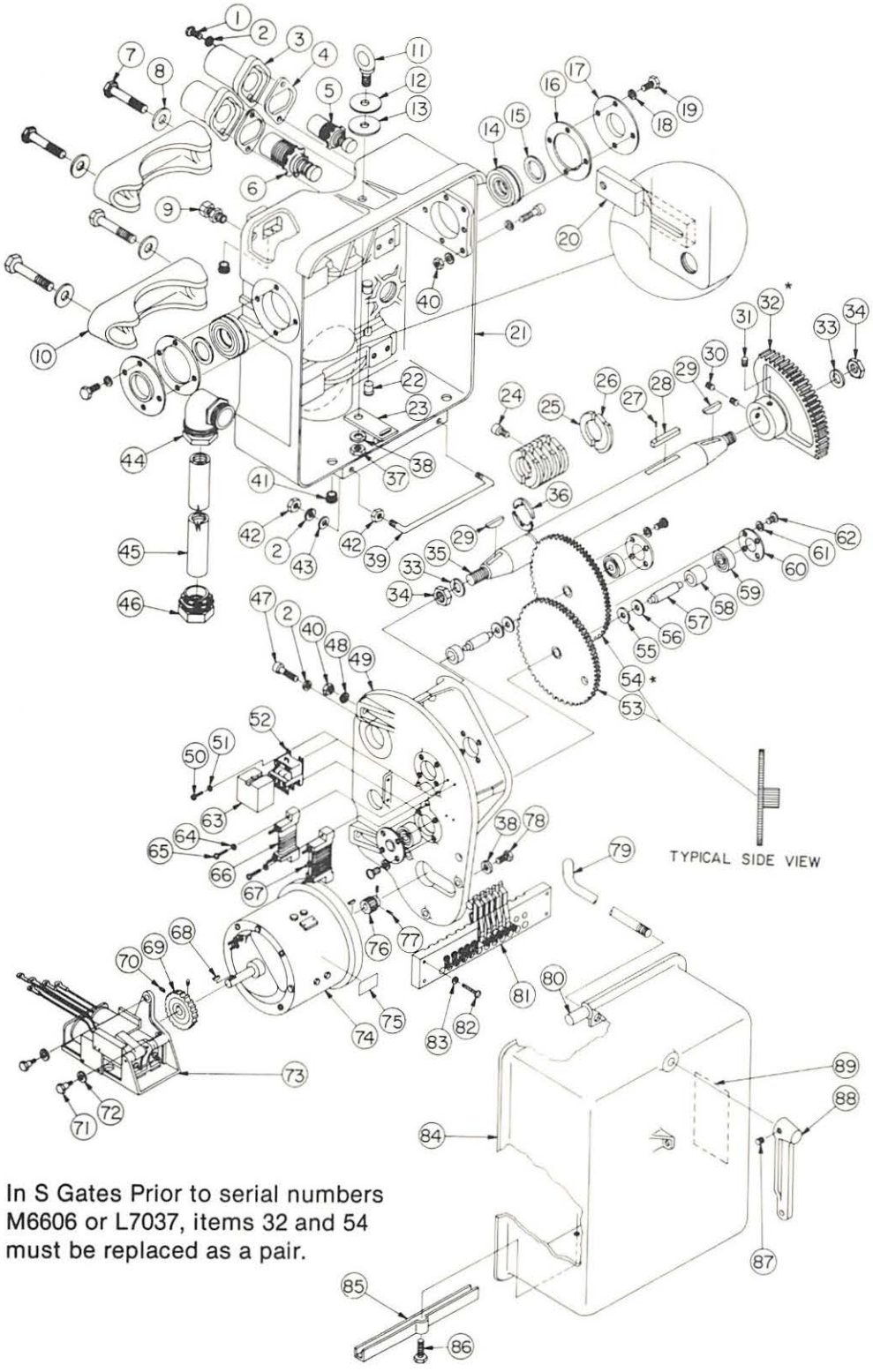
SIGNS FOR MODEL S CROSSING GATE MAST MOUNTED

Safetran's low cost, long lasting signs are constructed of alloy aluminum. They are lightweight, easy to erect and maintain, and are corrosion resistant. The reflecting material, attached permanently to the sign face, has wide angle reflecting qualities that make the sign visible day or night. All signs are black image on white background. All appropriate 5 inch mounting hardware is included in the sign assemblies listed below.

To Order: Specify Description and Part Number.

Description	Part Number	
Railroad Crossing Sign	035200-17X	
Railway Crossing Sign	035201-7X	
Stop on Red Signal Sign	035204-5X	
Number of Tracks Sign Specify # of Tracks	035236-#X	

MODEL S GATE MECHANISM ASSEMBLY



*NOTE: In S Gates Prior to serial numbers M6606 or L7037, items 32 and 54 must be replaced as a pair.

MODEL S GATE MECHANISM REPLACEMENT PARTS

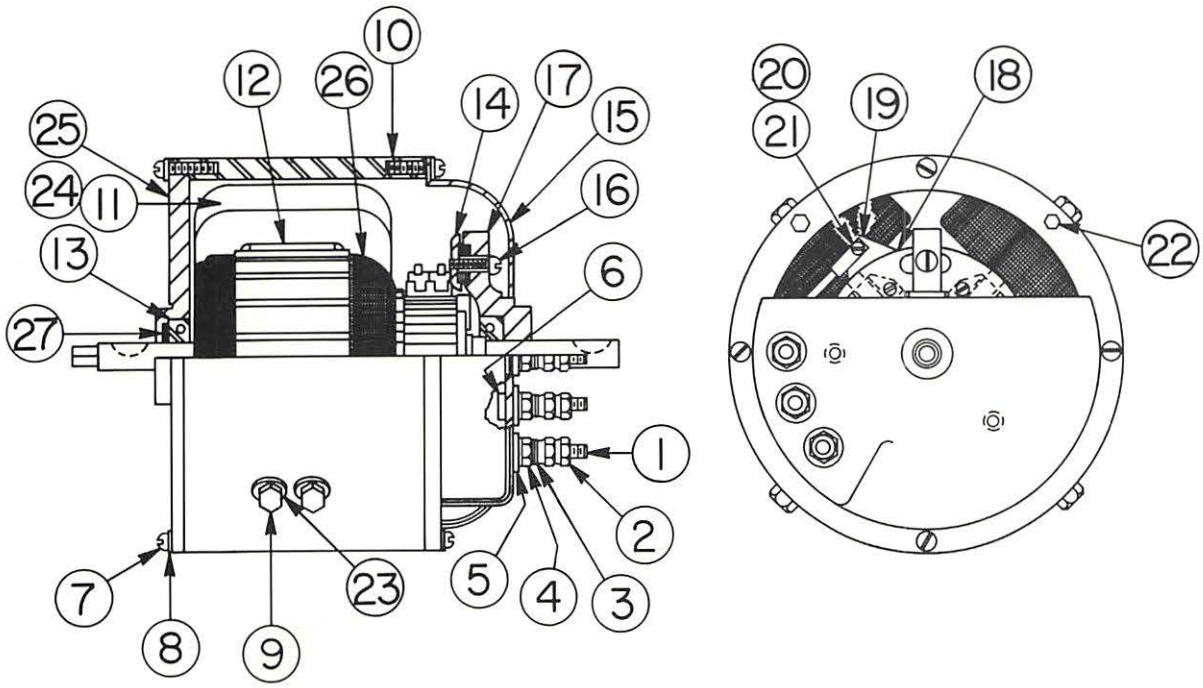
Complete Assembly Number 070900-22X

To Order: Specify Description and Part Number

Item No.	Description	Qty. Req.'d	Part Number
1	Cap Screw, Hex Head, 3/8"-16 x 1.25"	4	4089-HSC
2	Washer, Spring Lock, M, 3/8"	12	1810-MSC
3	Casting, Buffer Cap	2	070902-1
4	Gasket, Buffer Cap	2	070926-1
5	Buffer, Top Assembly	1	070903-X
6	Buffer, Bottom Assembly	1	070903-2X
7	Cap Screw, Hex Head, 3/4"-10 x 6"	4	4286-HSC
8	Washer, Wrought, 3/4"	4	1758-C
9	Connector, Relief, 3/4"	1	7354
10	Casting, Aluminum Saddle	2	070950
11	Bolt, Eye, 1/2" x 1.5	1	7099
12	Washer, Wrought, 1/2"	1	1755-SC
13	Washer, Sealing	1	070980-4
14	Bearing, Roller	2	070587-A
15	O-Ring, 2"	2	070585
16	Gasket, Seal Plate	2	070747-3
17	Casting, Aluminum Plate	2	070544-3
18	Washer, Spring Lock, M, 5/16"	8	1809-MSC
19	Cap Screw, Hex Head, 5/16"-18 x .75"	8	4044-HSC
20	Nut, Slot	4	070950-1
21	Housing, Gate	1	070900-13
22	Cap, Plug	8	070986
23	Plate, Latch Assembly	1	070919-3X
24	Cap Screw, Socket Head, 1/4"-20 x .875"	10	4003-SSC
25	Bracket, Cam	5	070633-A
26	Cam, Contact Assembly	5	070633-2X
27	Pin, Dowel, 1/4" x 1"	1	1123-S
28	Key	1	070547
29	Key, Woodruff, #UX	2	7149
30	Set Screw, Socket Head, 1/2"-13 x .375"	2	4704-SC
31	Set Screw, Socket Head, 1/2"-13 x .50"	1	4706-SC
32	Gear, Main Segment	1	070545-2
33	Washer, Spring Lock, M, 1"	2	1817-MSC
34	Nut, Hex, 1"-14	2	2119-SC
35	Shaft, Main	1	070543
36	Ring, Retaining	2	070584
37	Nut, Hex, 1/2"-13	1	2108-SC
38	Washer, Spring Lock, M, 1/2"	4	1812-MSC
39	Bolt, Hinge	1	070968-2
40	Nut, Hex, 3/8"-16	6	2154-SC
41	Bushing, Vent	4	041913-X
42	Nut, Hex, 3/8"-16	4	2104-SC
43	Washer, Wrought, 3/8"	2	1753-C
44	Connector, Elbow	1	070232
45	Conduit, Flexible	1	070692
46	Connector, Straight	1	070233

Item No.	Description	Qty. Req.'d	Part Number
47	Cap Screw, Socket Head, 3/8"-16 x 1.75"	6	4091-SSC
48	Washer, Shakeproof Lock, E, 3/8"	6	1860-ESC
49	Housing, Gear	1	070910-2
50	Machine Screw, Round Head, #8-32 x .375"	3	2572-RSC
51	Washer, Spring Lock, M, #8	3	1805-MSC
52	Relay, Gate Assembly	1	070941-X
53	Gear, Gate	1	070548-BX
54	Gear, Gate	1	070548-2X
55	Spacer, Tube	2	070550-2
56	Shim, Spring	2	070695-500X
57	Shaft, Gear	2	070550-1
58	Spacer, Tube	2	070550-3
59	Bearing	4	070588
60	Cover, Bearing	4	070553-A
61	Washer, Spring Lock, M, #10	20	1806-MSC
62	Machine Screw, Pan Head, #10-32 x .375"	16	2614-PSC
63	Cover, Relay	1	070941-1
64	Washer, Flat, #10	4	1712-SC
65	Machine Screw, Round Head, #10-32 x 1.50"	4	2624-RSC
66	Resistor, Fixed	1	029604-11X
67	Resistor, Adjustable	1	029602-4BX
68	Key, Woodruff, #10	2	7101
69	Ratchet, Hold Clear	1	070658-8X
70	Set Screw, Socket Head, 1/4"-28 x .25"	2	4615-SC
71	Bolt, Mounting	2	075084
72	Washer, Spring Lock, M, 3/8"	2	1810-MSC
73	Hold Clear Assembly	1	070780-AX
74	Motor Assembly	1	070640-3DX
75	Label, Warning	1	070980-2
76	Pinion, Motor	1	070554-A
77	Set Screw, Socket Head, 1/4"-28 x .25"	2	4615-SC
78	Cap Screw, Hex Head, 1/2"-13 x 1.25"	3	4167-HSC
79	Rod, Latch	1	070919-2
80	Gasket	1	070559-A
81	Board, Terminal Assy.	1	070625-6X
82	Machine Screw, Round Head, 1/4"-20 x 1.50"	4	2665-RSC
83	Washer, Spring Lock, M, 1/4"	4	1808-MSC
84	Cover, Cabinet Assembly	1	070901-2X
85	Retainer, Hinge	1	070968-4
86	Machine Screw, Slotted Hex Head, 5/16"-18 x 2.5"	1	2692-HSC
87	Set Screw, Socket Head, 3/8"-16 x .50"	1	7860-SC
88	Handle, Lock Latch	1	070909-4
89	Decal, Wiring	1	070976

MOTOR ASSEMBLY REPLACEMENT PARTS

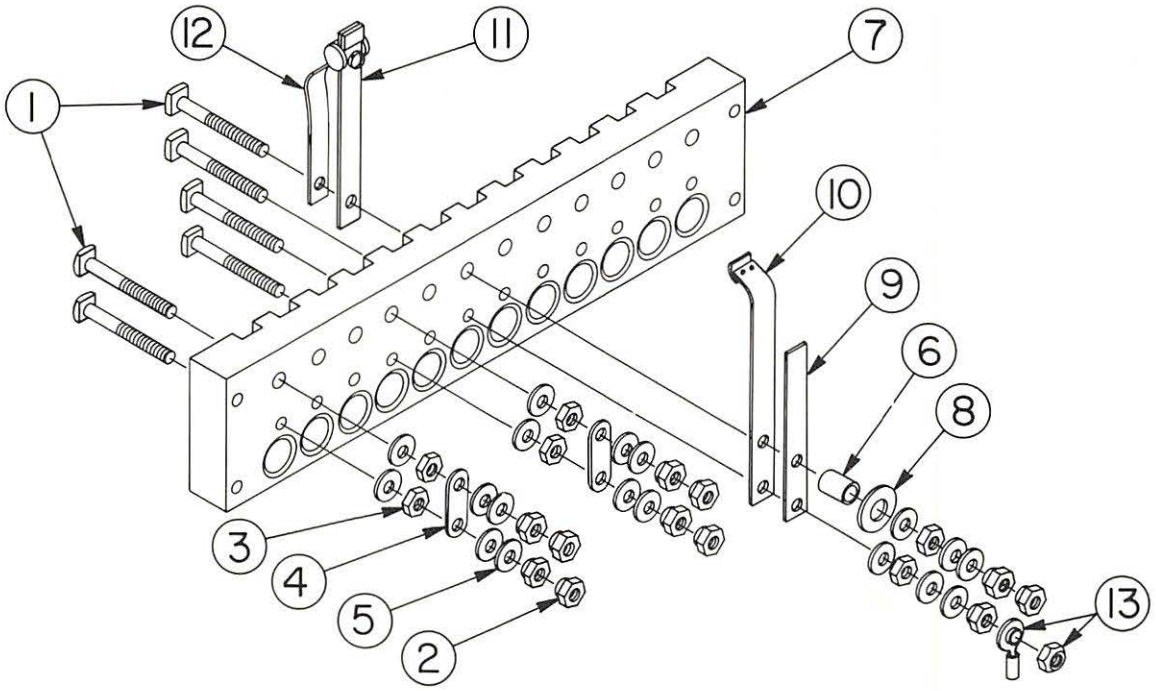


For Complete Assembly, Order Number 070640-3DX

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req.'d	Part Number	Item No.	Description	Qty. Req.'d	Part Number
1	Post, Binding	3	023833	15	Cover, End Motor	1	075119
2	Nut, Binding	6	023831	16	Machine Screw, Fillister Head, 1/4"-20 x .875"	8	2661-LSC
3	Washer, Beveled	15	023834				
4	Nut, Clamp	3	023832	17	End, Motor (Rear)	1	075118
5	Insulator, Lower	6	075123-1	18	Bracket, Assembly	1	075111-X
6	Insulator, Upper	3	075124-1	19	Brush, Motor Assembly	4	075116
7	Machine Screw, Fillister Head, 1/4"-20 x .875"	8	2661-LSC	20	Machine Screw, Round Head, #6-32 x .500"	6	2559-RBN
8	Washer, Kant Link Lock, 1/4"	1	1955	21	Washer, Cut, #6S	2	1704-B
				22	Machine Screw, Hex Head, #10-24 x .25"	2	2589-HSC
9	Cap Screw, Hex Head, 3/8"-16 x 1"	8	4088-HSC	23	Washer, Shakeproof Lock, I, 3/8"	8	1860-ISC
10	Housing, Motor	1	075120				
11	Coil, Field Assembly	1	075178-X	24	Tape, Insulator	8	075133-1
12	Pole, Field Assembly	1	075108-X	25	End, Motor	1	070689-C
13	Bearing, Ball	2	075142	26	Armature, Assembly	1	070682-BX
14	Clamp, Bracket	1	075117	27	Spacer	1	070695-500

TERMINAL BOARD ASSEMBLY REPLACEMENT PARTS

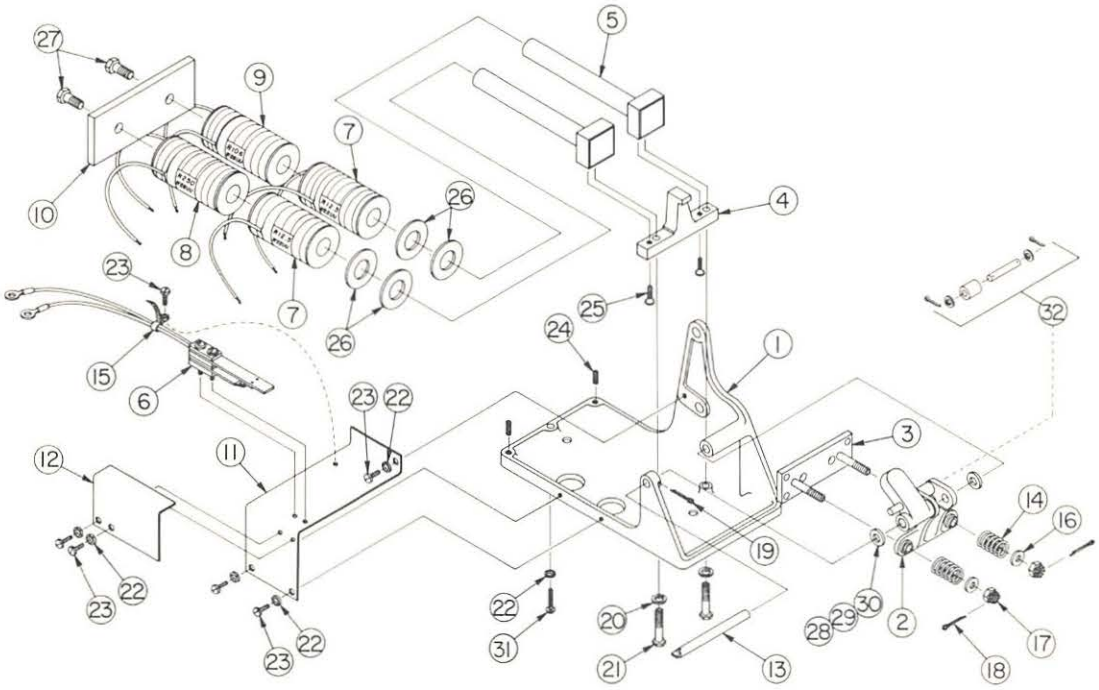


For Complete Assembly, Order Number 070625-6X

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req.'d	Part Number	Item No.	Description	Qty. Req.'d	Part Number
1	Post, Terminal	24	010427-6	8	Washer, Insulating	5	070627
2	Nut, Binding	48	023831	9	Spring, Reinforcing	5	070628
3	Nut, Clamp	24	023832	10	Contact, Fixed	5	070629-X
4	Connector	5	023839-2	11	Contact, Movable	5	070630-IX
5	Washer, Beveled	72	023834	12	Finger, Reinforcing	5	070632
6	Bushing, Insulating	5	041414	13	Eyelet, Test Assembly	1	024628-IX
7	Casting, Terminal Board	1	070625				

HOLD CLEAR ASSEMBLY REPLACEMENT PARTS

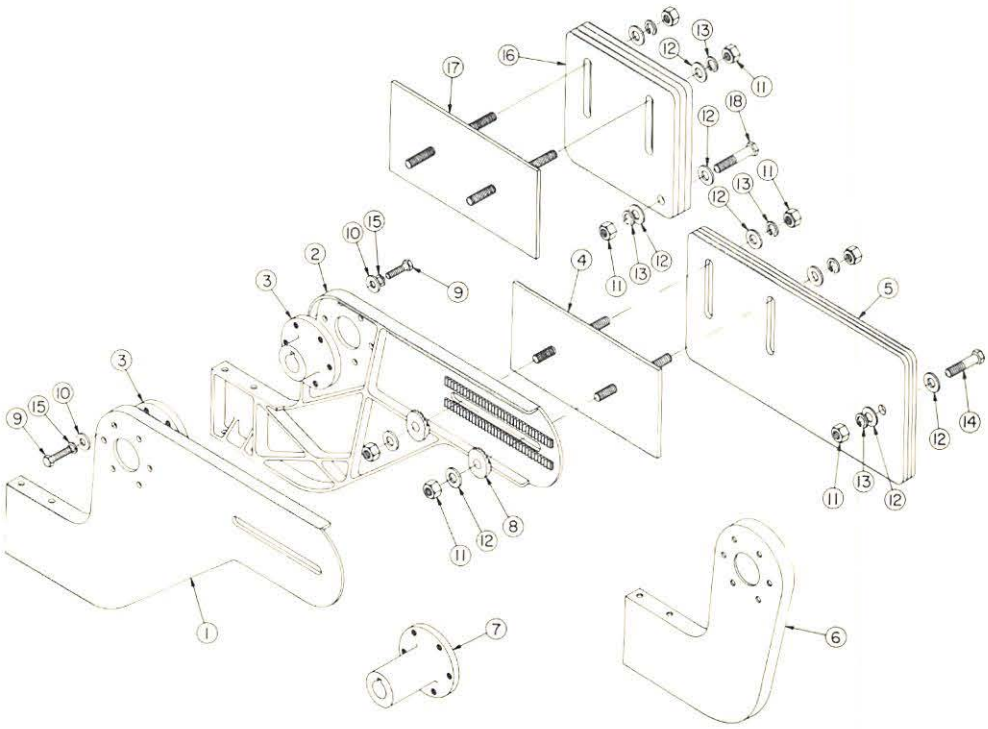


For Complete Assembly, Order Number 070780-AX

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req.'d	Part Number	Item No.	Description	Qty. Req.'d	Part Number
1	Frame, Hold Clear	1	070780-C	21	Cap Screw, Hex Head, 1/4"-28 x 1.25"	2	4026-HE
2	Bracket, Armature	1	070649-BX				
3	Armature Assembly	1	070647-X	22	Washer, Spring Lock, M, #10	6	1806-MSC
4	Stop, Hold Clear	1	070662-A				
5	Core, Hold Clear	2	070646-A	23	Machine Screw, Pan Head, #10-32 x .375"	6	2614-PSC
6	Contact, Power Down	1	070777-2AYX				
7	Coil, Pick Up (12.5 Ohm)	2	070665-1X	24	Set Screw, Socket Head, #10-32 x .5"	2	7852
8	Coil, Hold Clear (250 Ohm)	1	070665-X				
9	Coil, Hold Clear (106 Ohm)	1	070665-3X	25	Machine Screw, Flat #10-32 x .5"	2	2616-FBN
10	Yoke, Hold Clear	1	070645-A				
11	Support, Contact	1	070770-A	26	Washer	4	040524-A
12	Plate, Cover	1	070770-1	27	Cap Screw, Hex Head, 5/16"-18 x .75"	2	4044-HE
13	Pivot, Armature	1	070652				
14	Spring, Compression	2	070651	28	Washer, .063"	4	070653
15	Tie, Cable	1	18-04-002	29	Washer, .032"	4	070653-1
16	Washer, Shoulder	2	1978-F	30	Washer, .010"	4	070653-2
17	Nut, Castle, 1/4"-28	2	2494-SN	31	Machine Screw, Round Head, #10-32 x .875"	1	2620-RBN
18	Pin, Cotter, 1/16" x .5"	2	1000-BN				
19	Pin, Cotter, 1/16" x .75"	1	1001-SC	32	Kit, Hold Clear Shaft and Roller	1	070665-5X
20	Washer, Spring Lock, M, 1/4"	2	1808-ME				

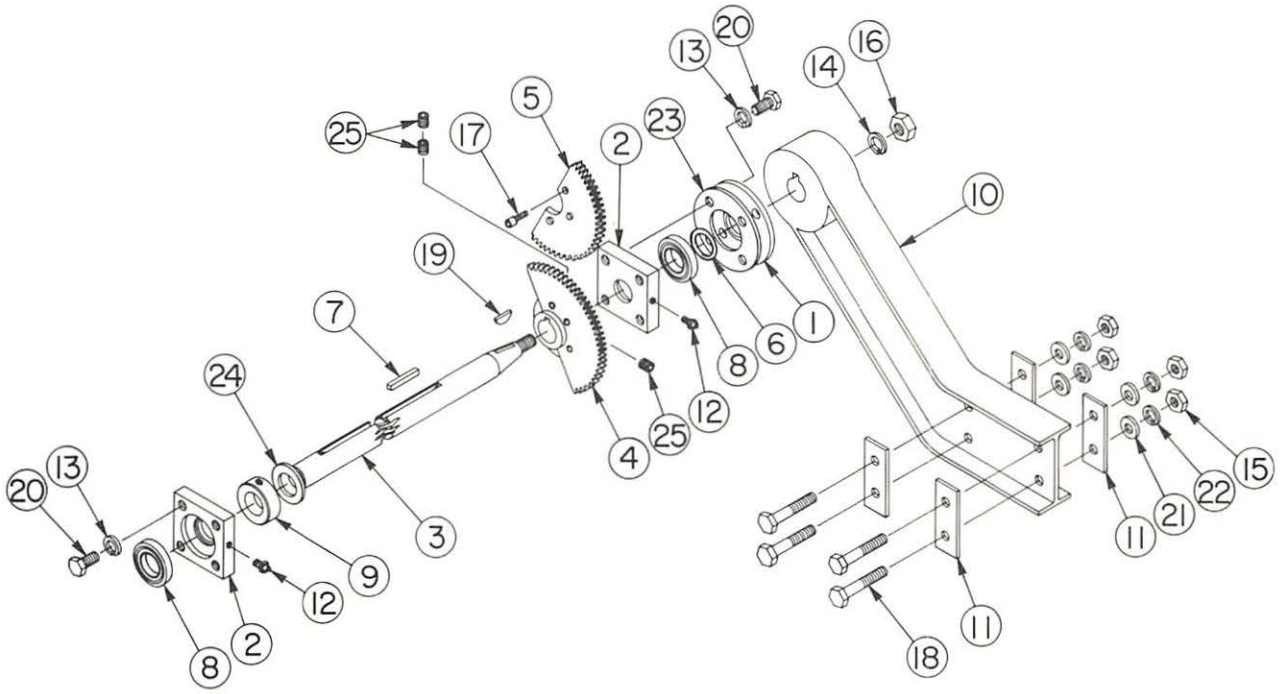
GATE ARM SUPPORTS/COUNTERWEIGHTS REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Support, Left Hand Gate Arm	070920-L
2	Support, Right Hand Gate Arm	070920-R
3	Hub, Gate Arm Support	070923-3
4	Plate, Stud (for wood arms 13' - 36' and all fiberglass arms)	070757-26X
	Plate, Stud (for wood arms 37' - 42')	070757-24X
5	Counterweight, Steel, 1/2" x 15" x 30", 63 lbs.	070755-4
6	Support, Left Hand Gate Arm, for use without counterweights	070921-L
7	Hub, Extended (for sidewalk arms)	070575-1X
8	Ratchet, Counterweight Bolt	070924
9	Cap Screw, Hex Head, 1/2"-13 x 1.25"	4167-HSC
10	Washer, Wrought, 1/2"	1755-C
11	Nut, Hex, 3/4"-10	2114-SC
12	Washer, Wrought, 3/4"	1758-C
13	Washer, Spring Lock, M, 3/4"	1815-MSC
14	Cap Screw, Hex Head, 3/4"-10 x 2" (for 1 - 2 c'wts.)	4274-HSC
	Cap Screw, Hex Head, 3/4"-10 x 3" (for 3 - 4 c'wts.)	4278-HSC
	Cap Screw, Hex Head, 3/4"-10 x 4" (for 5 - 6 c'wts.)	4282-HSC
	Machine Bolt, Hex Head, 3/4"-10 x 6.5" (for 7 - 10 c'wts.)	3177-SC
15	Washer, Spring Lock, M, 1/2"	1812-MSC
16	Counterweight, Steel, 5/8" x 15" x 15", 38 lbs.	070755-34
17	Plate, Stud (for wood arms to 36' and all fiberglass arms)	070757-30X
	Plate, Stud (for wood arms 37' - 46')	070757-31X
18	Cap Screw, Hex Head, 3/4"-10 x 2.5" (for 1 - 3 c'wts.)	4276-HSC
	Cap Screw, Hex Head, 3/4"-10 x 5" (for 3 - 7 c'wts.)	4284-HSC
	Machine Bolt, Hex Head, 3/4"-10 x 7.5" (for 8 - 10 c'wts.)	3179-SC
	Machine Bolt, Hex Head, 3/4"-10 x 14" (for 11 - 20 c'wts.)	3190-SC

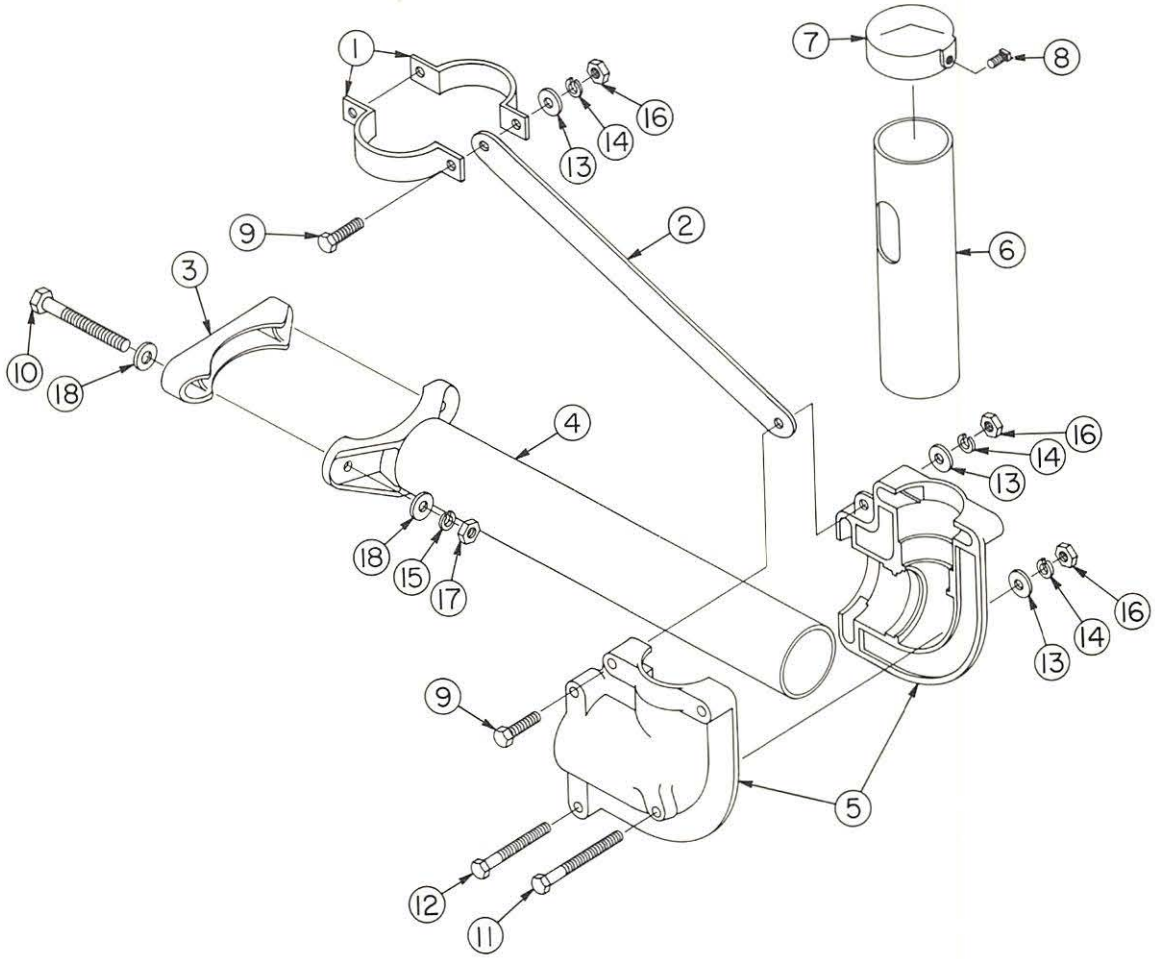
AUXILIARY SHAFT AND SUPPORT REPLACEMENT PARTS FOR WOOD AND FIBERGLASS SIDEWALK ARMS



To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Plate, Seal	1	070566-1
2	Housing, Bearing	2	070567
3	Shaft, Sidewalk Arm	1	070568
4	Gear, Sidewalk Arm	1	070569-AX
5	Gear, Top	1	070569-2
6	O-ring, 1-1/4"	1	070585-1
7	Key	1	070595
8	Bearing	2	070596
9	Collar, Set Screw	1	070597
10	Support, Sidewalk Arm	1	070759-2X
11	Plate, Washer	4	070763
12	Fitting, Grease	2	110333-8A
13	Washer, Spring Lock, M, 1/2"	8	1812-MSC
14	Washer, Spring Lock, M, 5/8"	1	1814-MSC
15	Nut, Hex, 3/8"-16	4	2104-SC
16	Nut, Castle, 5/8"-11	1	2364-SC
17	Cap Screw, Socket Head, 3/8"-16 x 1.25"	3	4089-SSC
18	Cap Screw, Hex Head, 3/8"-16 x 2.75"	4	4095-HSC
19	Key, Woodruff	1	7102
20	Cap Screw, Hex Head, 1/2"-20 x 1"	8	4185-HSC
21	Washer, Wrought, 3/8"	4	1753-C
22	Washer, Spring Lock, M, 3/8"	4	1810-MSC
23	Gasket	1	070747-2
24	Washer, Wrought, 1-1/4"	1	1762-C
25	Set Screw, Socket Head, 3/8"-16 x .312"	3	4655-SC

SIDELIGHT CANTILEVER ASSEMBLY REPLACEMENT PARTS



For Complete Assembly, Order Number 041442-26X
To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd	Part Number
1	Clamp, Pipe, 5"	2	035015-A
2	Bar, Support	1	041442-30
3	Casting, Aluminum Clamp	1	070950
4	Pipe, Lower	1	041442-25X
5	Casting, Aluminum Elbow	2	041442-26
6	Pipe, Upper	1	041442-29
7	Pinnacle, 4" - 5"	1	035045-502
8	Set Screw, Square Head, 3/8"-16 x 1"	1	4932-SC
9	Cap Screw, Hex Head, 1/2"-13 x 2"	3	4170-HSC
10	Cap Screw, Hex Head, 3/4"-10 x 6"	2	4286-HSC
11	Cap Screw, Hex Head, 1/2"-13 x 6"	1	4182-HSC
12	Cap Screw, Hex Head, 1/2"-13 x 5"	4	4180-HSC
13	Washer, Wrought, 1/2"	8	1755-C
14	Washer, Spring Lock, M, 1/2"	8	1812-MSC
15	Washer, Spring Lock, M, 3/4"	2	1815-MSC
16	Nut, Hex, 1/2"-13	8	2108-SC
17	Nut, Hex, 3/4"-10	2	2114-SC
18	Washer, Flat, 3/4"	4	1737-SC

TORQUE WRENCH KIT

- Torque Wrench (ft.-lb. and in.-lb. readings)
- Ratcheting box end wrench (1/2 and 9/16 inches)
- Socket (1/2 inch, 3/8 inch drive)
- Allen Wrench (3/16 inch)
- Tool Box
- Ratchet Wrench (3/8 inch drive)
- Torque Adapter
- Instruction Sheet

Safetran's Torque Wrench Kit permits horizontal and vertical torque adjustments and measurements to be taken from the 1/2 inch hexagon end of the motor shaft on the Models S and SM Railroad Highway Crossing Gates, and on the Model SMB Industrial Gate. It provides a simpler method than the conventional manner with a spring scale for both measurements and adjustments.

The Torque Adapter, included in Safetran's Torque Wrench Kit, provides for torque adjustments to be made on older model gates. The adapter consists of a hex shaft made onto a collar which fits over the end of the motor pinion, and is held in place by a set screw.

The Torque Wrench Kit allows the gate arm to be cranked up, or in the case where the arm has been sheared off, to crank the weights to the horizontal position.

ORDERING INFORMATION

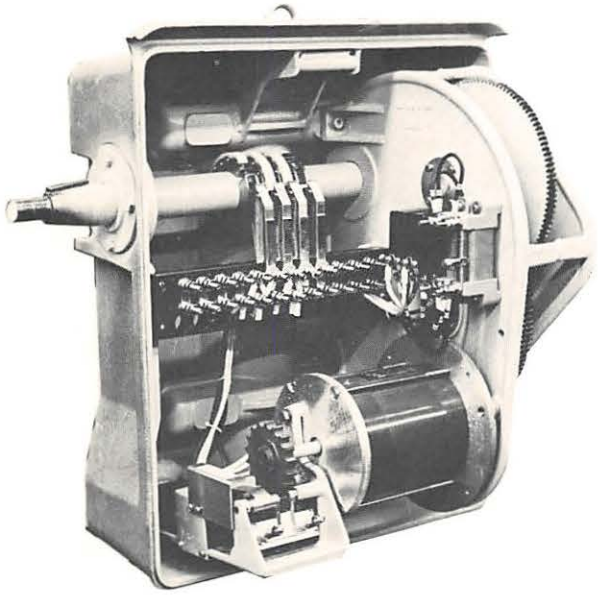
To Order: Specify Safetran Torque Wrench Kit and Part Number 070981-X.

For Torque Adapter only, included in above kit, order Part Number 070554-2X.

Safetran

RAILROAD HIGHWAY CROSSING GATE

MODEL SM



- MEETS APPLICABLE AAR SPECIFICATIONS
- WEATHERPROOF LIGHTWEIGHT CAST ALUMINUM HOUSING
- EQUIPPED WITH SEALED, FACTORY LUBRICATED BEARINGS
- PERMANENT MAGNET MOTOR
- GRAVITY RELEASE RATCHET TYPE HOLD CLEAR

The Model SM Gate is similar to the Model S Gate and uses the same gear train, hold clear, and mounting. Gate arms, counterweights, and other accessories are identical as well.

It is equipped with a permanent magnet 12 VDC motor rather than a series motor used in the Model S mechanism.

Steel gears mounted on ball bearing shafts provide a smooth running 240 to 1 reduction gear train. Sealed ball bearings on these shafts are factory lubricated and require no further maintenance.

Current consumption is 8-18 amperes for both the motor-up and motor-down cycles with applied voltage of not less than 11 volts at the motor terminals.

Holding the gate arm in the vertical position requires 34 milliamps at 12 volts.

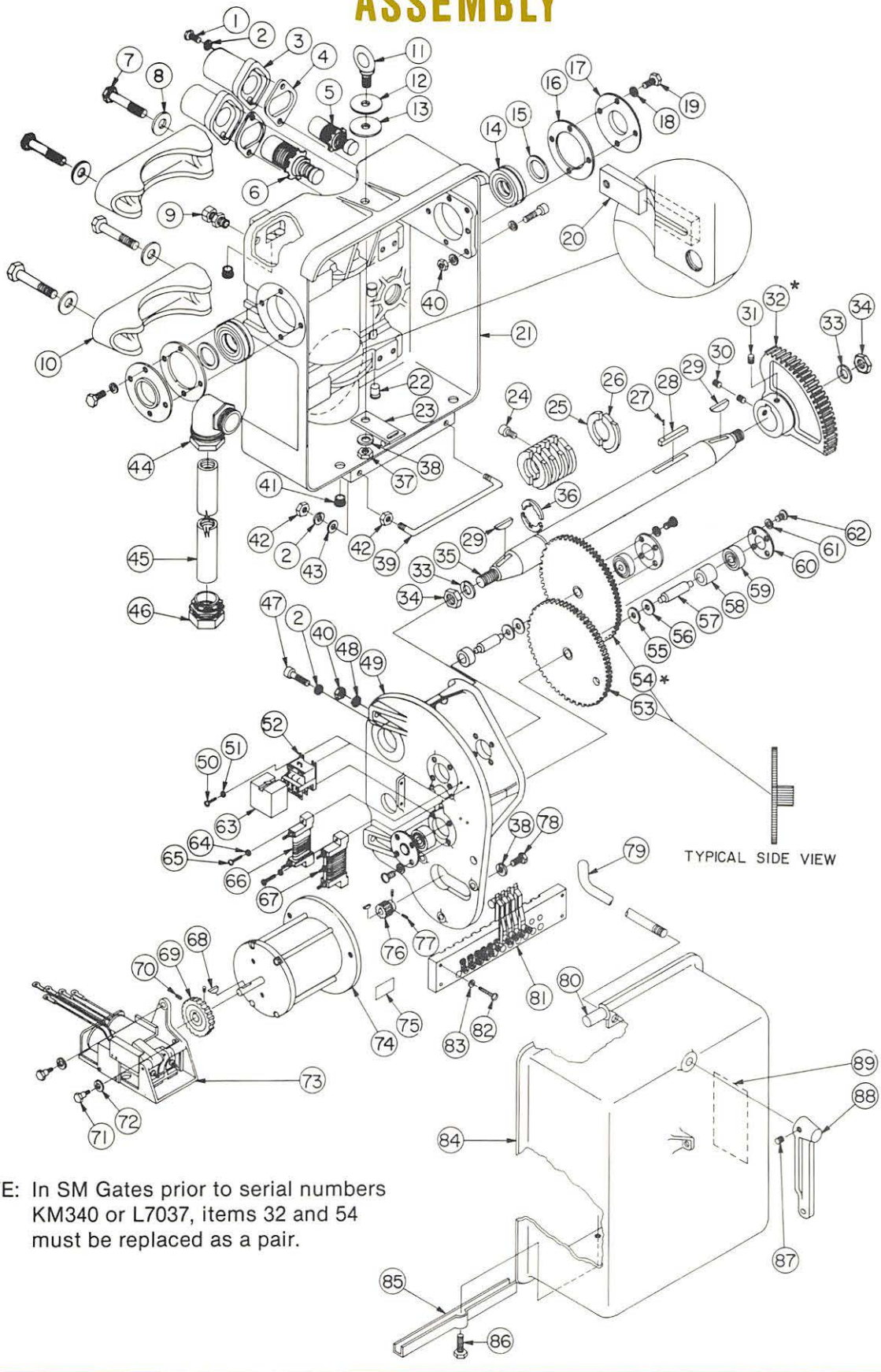
Adjustable circuit controller cams are mounted on the shaft. Contact springs are mounted on the terminal board forward in the assembly for ease of adjustment, inspection, and maintenance.

Cast aluminum gate arm supports are mounted on each end of the main shaft. They are adaptable for mounting of either wood, fiberglass or fiberglass/aluminum gate arms.

The Model SM Gate mechanism may be ordered with factory installed auxiliary shaft for application of sidewalk arm when required.

The cast cabinet is designed to mount directly on a five inch mast; however, adapters can also be furnished for mounting on four or eight inch masts.

MODEL SM GATE MECHANISM ASSEMBLY



*NOTE: In SM Gates prior to serial numbers KM340 or L7037, items 32 and 54 must be replaced as a pair.

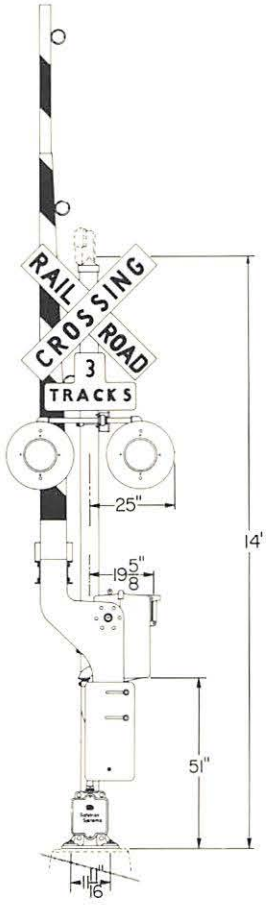
MODEL SM GATE MECHANISM REPLACEMENT PARTS

For Complete Assembly, Order Number 070900-21X
To Order: Specify Description and Part Number.

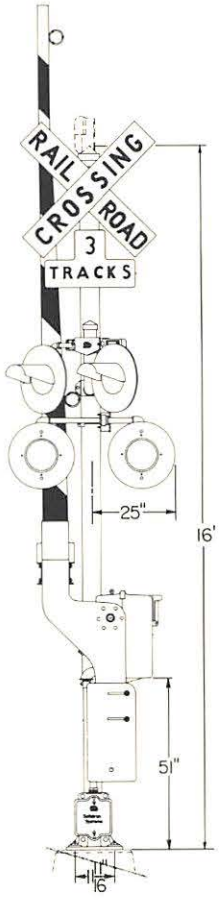
Item No.	Description	Qty. Req.'d	Part Number	Item No.	Description	Qty. Req.'d	Part Number
1	Cap Screw, Hex Head, 3/8"-16 x 1.25"	4	4089-HSC	47	Cap Screw, Socket Head, 3/8"-16 x 1.75"	6	4091-SSC
2	Washer, Spring Lock, M, 3/8"	12	1810-MSC	48	Washer, Shakeproof Lock, E, 3/8"	6	1860-ESC
3	Casting, Buffer Cap	2	070902-1	49	Housing, Gear	1	070910-2
4	Gasket, Buffer Cap	2	070926-1	50	Machine Screw, Round Head, #8-32 x .375"	3	2572-RSC
5	Buffer, Top Assembly	1	070903-X				
6	Buffer, Bottom Assembly	1	070903-2X	51	Washer, Spring Lock, M, #8	3	1805-MSC
7	Cap Screw, Hex Head, 3/4"-10 x 6"	4	4286-HSC	52	Relay, Gate Assembly	1	070941-3X
8	Washer, Wrought, 3/4"	4	1758-C	53	Gear, Gate	1	070548-BX
9	Connector, Relief, 3/4"	1	7354	54	Gear, Gate	1	070548-2X
10	Casting, Aluminum Saddle	2	070950	55	Spacer, Tube	2	070550-2
				56	Shim, Spring	2	070695-500X
11	Bolt, Eye, 1/2" x 1.5	1	7099	57	Shaft, Gear	2	070550-1
12	Washer, Wrought, 1/2"	1	1755-SC	58	Spacer, Tube	2	070550-3
13	Washer, Sealing	1	070980-4	59	Bearing	4	070588
14	Bearing, Roller	2	070587-A	60	Cover, Bearing	4	070553-A
15	O-Ring, 2"	2	070585	61	Washer, Spring Lock, M, #10	20	1806-MSC
16	Gasket, Seal Plate	2	070747-3				
17	Casting, Aluminum Plate	2	070544-3	62	Machine Screw, Pan Head, #10-32 x .375"	16	2614-PSC
18	Washer, Spring Lock, M, 5/16"	8	1809-MSC	63	Cover, Relay	1	070941-1
				64	Washer, Flat, #10	4	1712-SC
19	Cap Screw, Hex Head, 5/16"-18 x .75"	8	4044-HSC	65	Machine Screw, Round Head, #10-32 x 1.50"	4	2624-RSC
20	Nut, Slot	4	070950-1	66	Resistor, Fixed	1	029604-3AX
21	Housing, Gate	1	070900-13	67	Resistor, Adjustable	1	029602-6AX
22	Cap, Plug	8	070986	68	Key, Woodruff, #10	2	7101
23	Plate, Latch Assembly	1	070919-3X	69	Ratchet, Hold Clear	1	070658-8X
24	Cap Screw, Socket Head, 1/4"-20 x .875"	10	4003-SSC	70	Set Screw, Socket Head, 1/4"-28 x .25"	2	4615-SC
25	Bracket, Cam	5	070633-A	71	Bolt, Mounting	2	075084
26	Cam, Contact Assembly	5	070633-2X	72	Washer, Spring Lock, M, 3/8"	2	1810-MSC
27	Pin, Dowel, 1/4" x 1"	1	1123-S				
28	Key	1	070547	73	Hold Clear Assembly	1	070780-AX
29	Key, Woodruff, #UX	2	7149	74	Motor Assembly	1	070640-4X
30	Set Screw, Socket Head, 1/2"-13 x .375"	2	4704-SC	75	Label, Warning	1	070980-2
				76	Pinion, Motor	1	070554-A
31	Set Screw, Socket Head, 1/2"-13 x .50"	1	4706-SC	77	Set Screw, Socket Head, 1/4"-28 x .25"	2	4615-SC
32	Gear, Main Segment	1	070545-2	78	Cap Screw, Hex Head, 1/2"-13 x 1.25"	3	4167-HSC
33	Washer, Spring Lock, M, 1"	2	1817-MSC				
				79	Rod, Latch	1	070919-2
34	Nut, Hex, 1"-14	2	2119-SC	80	Gasket	1	070559-A
35	Shaft, Main	1	070543	81	Board, Terminal Assy.	1	070625-10X
36	Ring, Retaining	2	070584	82	Machine Screw, Round Head, 1/4"-20 x 1.50"	4	2665-RSC
37	Nut, Hex, 1/2"-13	1	2108-SC				
38	Washer, Spring Lock, M, 1/2"	4	1812-MSC	83	Washer, Spring Lock, M, 1/4"	4	1808-MSC
39	Bolt, Hinge	1	070968-2	84	Cover, Cabinet Assembly	1	070901-2X
40	Nut, Hex, 3/8"-16	6	2154-SC	85	Retainer, Hinge	1	070968-4
41	Bushing, Vent	4	041913-X	86	Machine Screw, Slotted Hex, Head, 5/16"-18 x 2.5"	1	2692-HSC
42	Nut, Hex, 3/8"-16	4	2104-SC				
43	Washer, Wrought, 3/8"	2	1753-C	87	Set Screw, Socket Head, 3/8"-16 x .50"	1	7860-SC
44	Connector, Elbow	1	070232				
45	Conduit, Flexible	1	070692	88	Handle, Lock Latch	1	070909-4
46	Connector, Straight	1	070233	89	Decal, Wiring	1	070976-502

ORDERING INFORMATION

Type SM Gate
Mounted on Stub Mast



Type SM Gate with
Front and/or Back
Flashing Lights



Type SM Gate with
Front and/or Back Flashing
Lights and Cantilever
Mounted Sidelights

To Order: Specify the following:

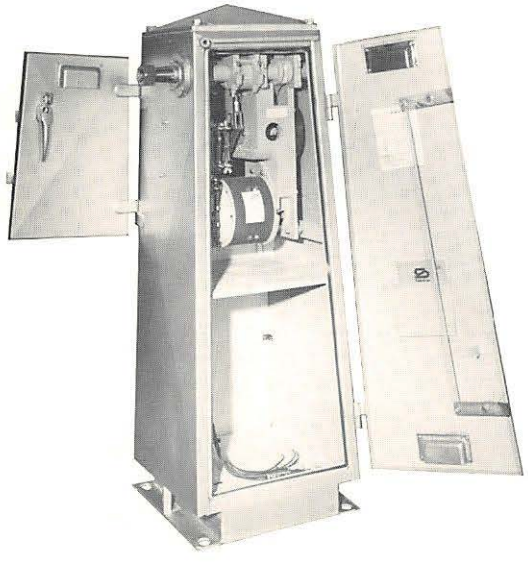
1. Model SM Gate type, location of flashing lights and/or sidelights (specify one or two way), and if auxiliary arm is required.
2. FLX-10 or FLX-12 flashing lamp, roundel type and bulb type. (See section A-7)
3. Bell, if desired, and type as follows: AC, DC, or AC-DC operation, loud or soft tone. (See Section A-8). If bell is not ordered, pinnacle is provided.
4. Signs desired. (See page A-3-3).
5. Gate arm type and length. (See section A-6).
6. If Auxiliary Arm is required, specify arm type and length.

For additional ordering information, see section A-3.

Safetran

RAILROAD HIGHWAY CROSSING GATE

MODEL EM



- **FOUNDATION MOUNTED WEATHERPROOF STEEL CABINET**
- **LOW POWER CONSUMPTION**
- **EQUIPPED WITH SEALED, FACTORY LUBRICATED BEARINGS**
- **GRAVITY RELEASE, RATCHET TYPE HOLD CLEAR**

The Model EM Electro-Mechanical Railroad Highway Crossing Gate Mechanism operates within a foundation mounted weather proof steel housing amply ventilated by grills in both doors. Steel gears mounted within a cast iron housing provides a smooth running 250 to 1 reduction gear train. The gear shafts operate on ball bearings, which are factory sealed with all weather grease and require no further lubrication.

The mechanism is powered by a 12 VDC series motor designed for this use. It will operate the longest, properly counter-weighted gate arms smoothly and rapidly.

Current requirement in raising the gate is 6 to 9 amperes, dependent upon length, weight, and counterbalancing. A voltage of 11 to 16 volts is required at the motor terminals. A separate circuit controller is bolted to the side of the pedestal and connected to the main gate arm shaft by an adjustable connecting rod.

The hold clear mechanism keeps the gate in the clear position with a minimum electric current and drops by gravity.

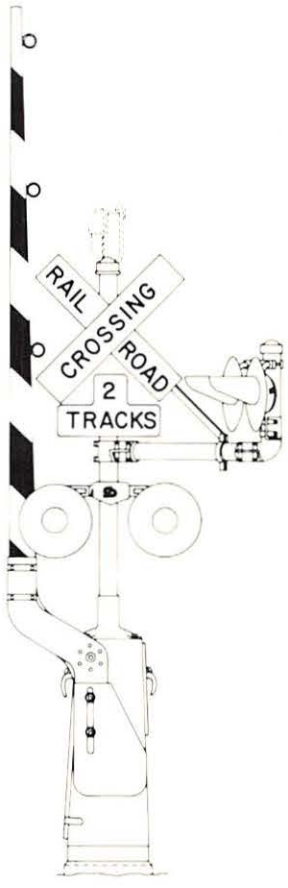
Cast aluminum gate arm supports, mounted on each end of the main shaft, are adaptable for mounting of either wood, fiberglass, or fiberglass/aluminum gate arms.

The steel cabinet mounts directly on a foundation with bolt spacing of 19 x 19 inches. Adapters can also be furnished for mounting on 11-11/16 x 11-11/16 inch bolt spacing as well.

ORDERING INFORMATION

Type 100
Without Lights

Type 101
With front and/or
back lights



Type 102
With front and/or
back lights, one or
two way sidelights

To Order: Specify the following:

1. Model EM Gate Type and location of lights and/or sidelights.
2. Either FLX-10 or FLX-12 Flashing Lamps, lens type, and bulb type (See section A-7).
3. Bell, if desired, and type as follows: AC, DC, or AC-DC operation, loud or soft tone (See section A-8). If bell is not ordered, pinnacle is provided.
4. Signs desired (See page A-5-3).
5. Gate arm type and length (See section A-6).
6. Turntable assembly, if desired (See page A-5-11).
7. If Auxiliary Arm is required, specify arm type and length.

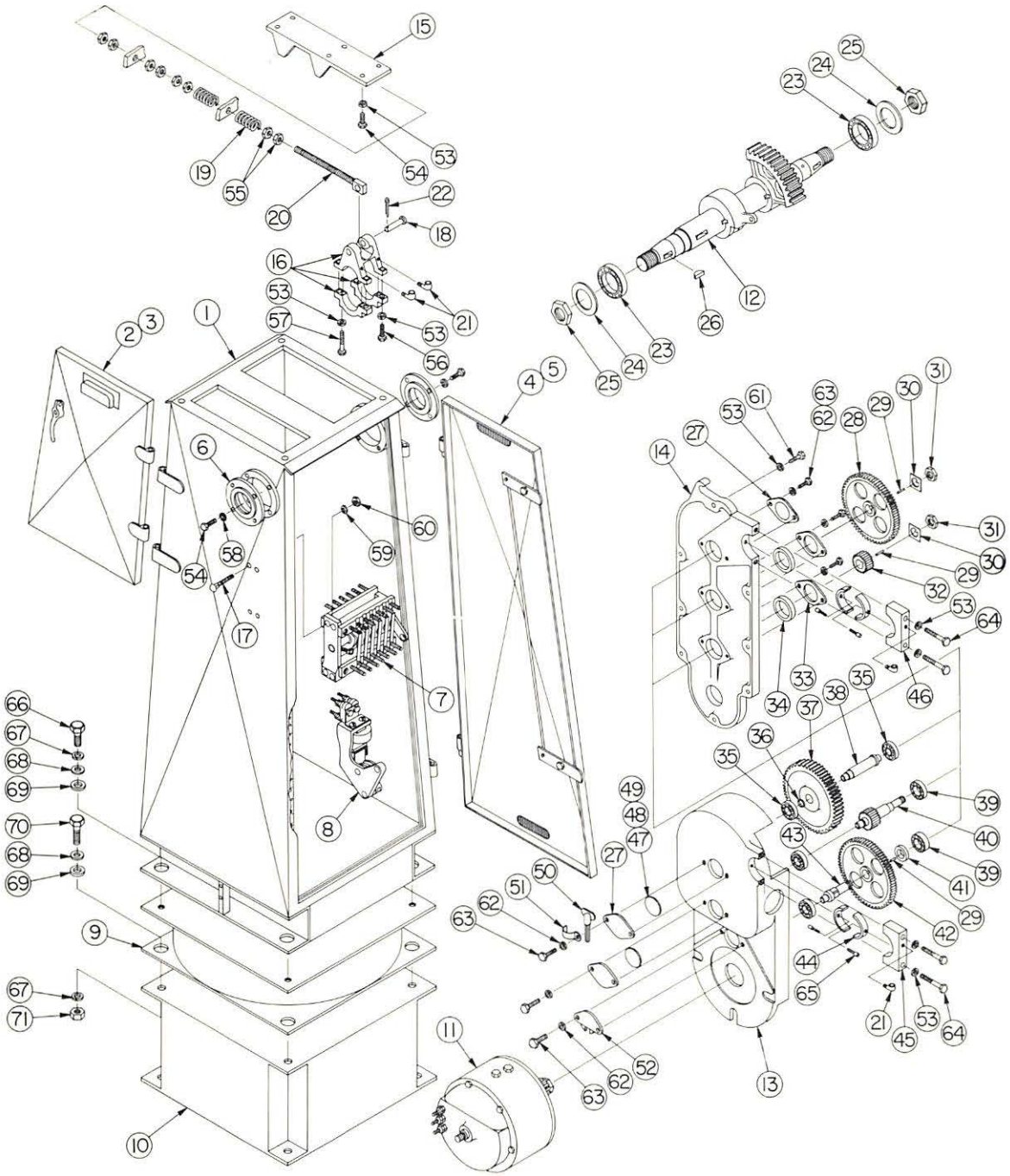
SIGNS FOR MODEL EM
RAILROAD HIGHWAY CROSSING GATE

Safetran's low cost, long lasting signs are constructed of alloy aluminum. They are lightweight, easy to erect and maintain, and are corrosion resistant. The reflecting material, attached permanently to the sign face, has wide angle reflecting qualities that make the sign visible day or night. All signs are black image on white background. All appropriate mounting hardware is included in the sign assemblies listed below:

To Order: Specify Description and Part Number.

Description	Part Number	
Railroad Crossing Sign Railway Crossing Sign	035200-4X 035201-4X	
Stop on Red Signal Sign	035204-3X	
Number of Tracks Sign Specify # of tracks	035215-#X	

MODEL EM MECHANISM ASSEMBLY

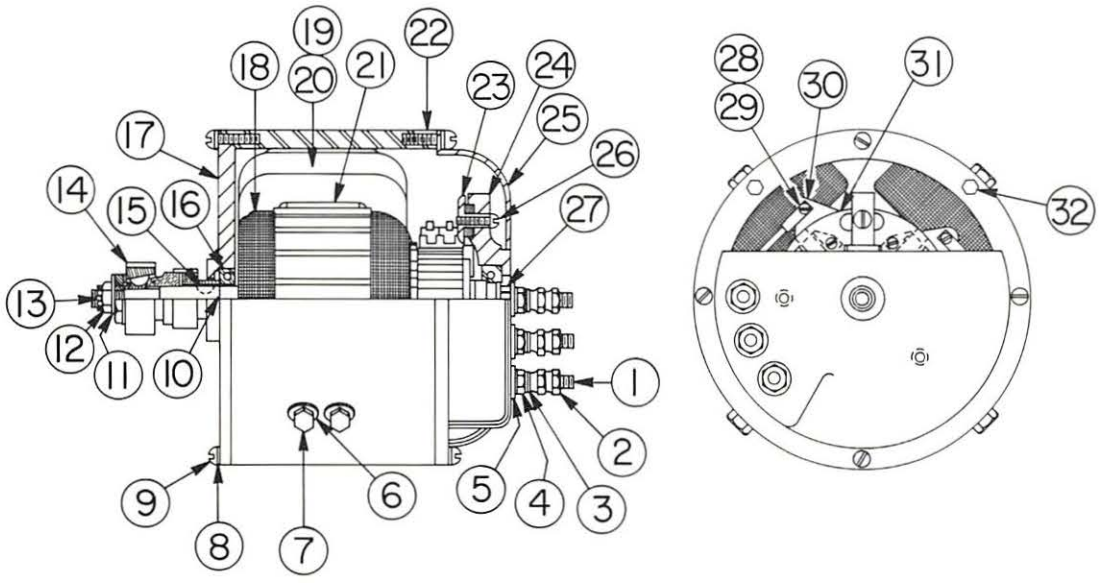


MODEL EM MECHANISM ASSEMBLY REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number	Item No.	Description	Qty. Req'd	Part Number
1	Pedestal Assembly (with doors)	1	075500-X	41	Spacer, Lower Shaft	1	075207
2	Door, Short	1	075508-1X	42	Gear, Lower	1	075203
3	Packing, Door, Short	1	104510	43	Shaft, Lower	1	075204
4	Door, Long	1	075507-1X	44	Bushing	2	075218
5	Packing, Door, Long	1	104510-A	45	Clamp, Bearing	1	075220
6	Cap, Bearing	2	075523	46	Clamp, Bearing	1	075221
7	Controller Assembly	1	075150-X	47	Shim, Bearing, .022"	1	075223-1
8	Hold Clear Assembly	1	075040-X	48	Shim, Bearing, .040"	1	075223-2
9	Turntable, Pedestal	1	075545-X	49	Shim, Bearing, .060"	1	075223-3
10	Spacer, Pedestal	1	075542-4X	50	Wrench, Cam	1	075978-X
11	Motor Assembly, EM	1	075100-X	51	Holder, Wrench	1	075350
12	Shaft, Gate Arm	1	075275-X	52	Cap, Recessed Bearing	1	075209
13	Housing, Gear	1	075201	53	Washer, Spring Lock, M, 3/8"	27	1810-MSC
14	Cover, Gear Housing	1	075202	54	Cap Screw, Hex Head, 3/8" - 16 x .75"	14	4086-HSC
15	Bracket, Buffer	1	075301				
16	Arm & Cap, Buffer	1	075304	55	Nut, Buffer	8	075307
17	Carriage Bolt, 5/16" - 18 x 1.75"	4	6002-CO	56	Cap Screw, Hex Head, 3/8" - 16 x 1.25"	4	4088-HSC
18	Pin, Buffer Rod	1	075305				
19	Spring	2	075308	57	Cap Screw, Hex Head, 3/8" - 16 x 2.25"	4	4093-HSC
20	Rod, Buffer	1	075302				
21	Cup, Oil	4	075188	58	Washer, Spring Lock, M, 3/8"	10	1810-MSC
22	Pin, Cotter, 1/16" x 1"	1	1002-SC	59	Washer, Spring Lock, M, 5/16"	4	1809-MSC
23	Bearing	2	075284	60	Nut, Hex, 5/16" - 18	4	2102-SC
24	Seal, Grease	2	075284-1	61	Cap Screw, Hex Head, 3/8" - 16 x 1.5"	8	4090-HSC
25	Nut, Hex, 1 1/2" - 6	2	2213-SC				
26	Key, Woodruff	2	075410	62	Washer, Spring Lock, 5/16"	12	1809-SC
27	Cap, Bearing	3	075217	63	Cap Screw, Hex Head, 5/16" - 18 x .75"	12	4044-HSC
28	Gear, Intermediate	1	075211				
29	Key, Gear & Pinion	2	075206	64	Cap Screw, Hex Head, 3/8" - 16 x 2.5"	4	4094-HSC
30	Washer, Lock	2	1967-S				
31	Nut, Lock	2	2351-S	65	Cap Screw, Socket Head, #5 - 40 x .25"	4	7704-SSC
32	Pinion, Bottom	1	075205				
33	Retainer, Bearing	2	075208	66	Cap Screw, Hex Head, 3/4" - 10 x 1.25"	4	4271-HSC
34	Spacer	2	075212				
35	Bearing, Ball	4	075225	67	Washer, Spring Lock, M, 3/4"	8	1815-MSC
36	Ring, Retaining	1	7566	68	Washer, Flat, 3/4"	8	1758-C
37	Gear & Pinion, Cluster	1	075216	69	Washer, Spacer	8	1737-SC
38	Shaft, Upper	1	075215	70	Cap Screw, Hex Head, 3/4" - 10 x 2"	4	4274-HSC
39	Bearing, Ball	2	075224				
40	Shaft, Intermediate	1	075213-1X	71	Nut, Hex, 3/4" - 10	4	2114-SC

MOTOR ASSEMBLY REPLACEMENT PARTS

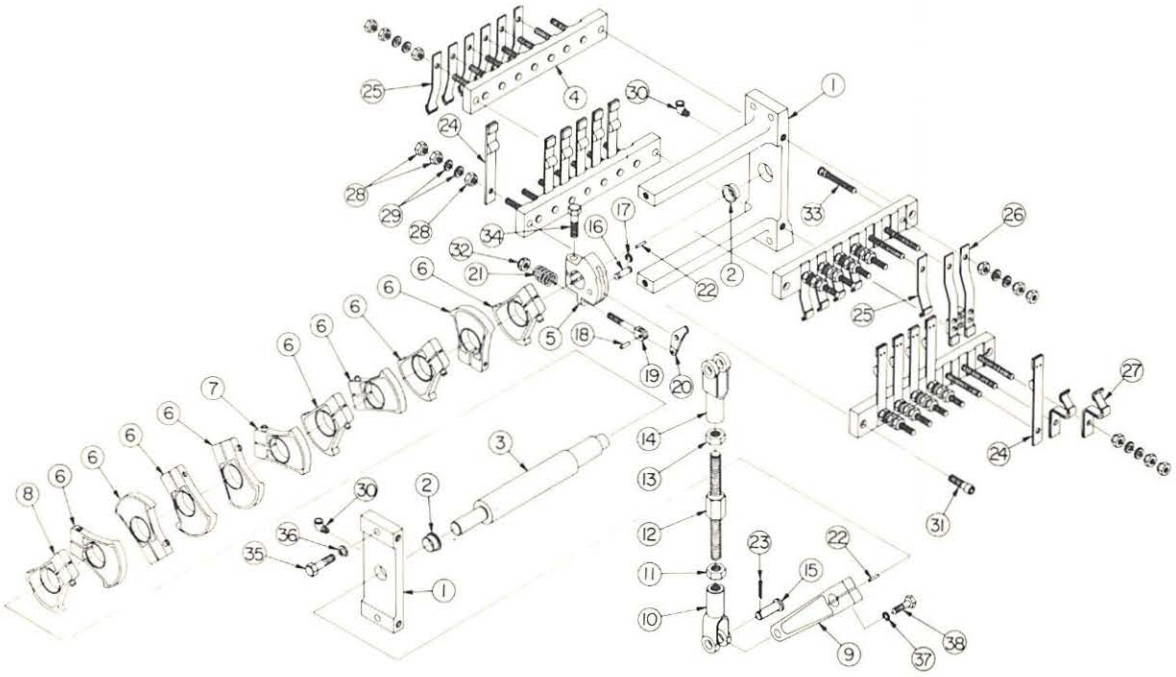


For complete assembly, order part number 075100-X.

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number	Item No.	Description	Qty. Req'd	Part Number
1	Post, Binding	3	023833	18	Armature Assembly	1	075101-X
2	Nut, Binding	6	023831	19	Coil, Field Assembly	1	075107-X
3	Washer, Beveled	15	023834	20	Insulation, Field Coil	8	075133
4	Nut, Clamp	3	023832	21	Pole, Field Assembly	4	075108-X
5	Insulator, Bottom	6	075123-1	22	Housing, Motor	1	075120
6	Washer, Internal Lock, 3/8"	8	1860-SC	23	Clamp, Brush Bracket	1	075117
7	Cap Screw, Hex Head, 3/8"-16 x 1"	8	4088-HSC	24	End, Motor, Rear	1	075118
				25	Cover, Motor End	1	075119
8	Washer, Spring Lock, 1/4"	8	1808-QSC	26	Machine Screw, Fillister Head, 1/4"-20 x 1"	1	2662-LSC
9	Machine Screw, Fillister Head, 1/4"-20 x .75"	8	2660-LSC				
				27	Bushing, Insulating	3	075124-1
10	Shim	1	075138	28	Machine Screw, Round Head, #6-32 x .4375"	2	2558-RBN
11	Washer, Flat, 7/16"	1	1754-C				
12	Nut, Castle, 7/16"-20	1	2362-SC	29	Washer, Flat, #6	2	1704-B
13	Pin, Cotter, 3/32" x 1"	1	1009-SC	30	Brush, Motor Assembly	4	075116
14	Coupling, Flexible	1	075126-X	31	Bracket, Brush Holder	1	075111-X
15	Key, Woodruff, #2	2	7103	32	Machine Screw, Hex Head, #10-24 x .3125"	2	2589-SC
16	Bearing, Ball	2	075142				
17	End, Motor, Front	1	075121				

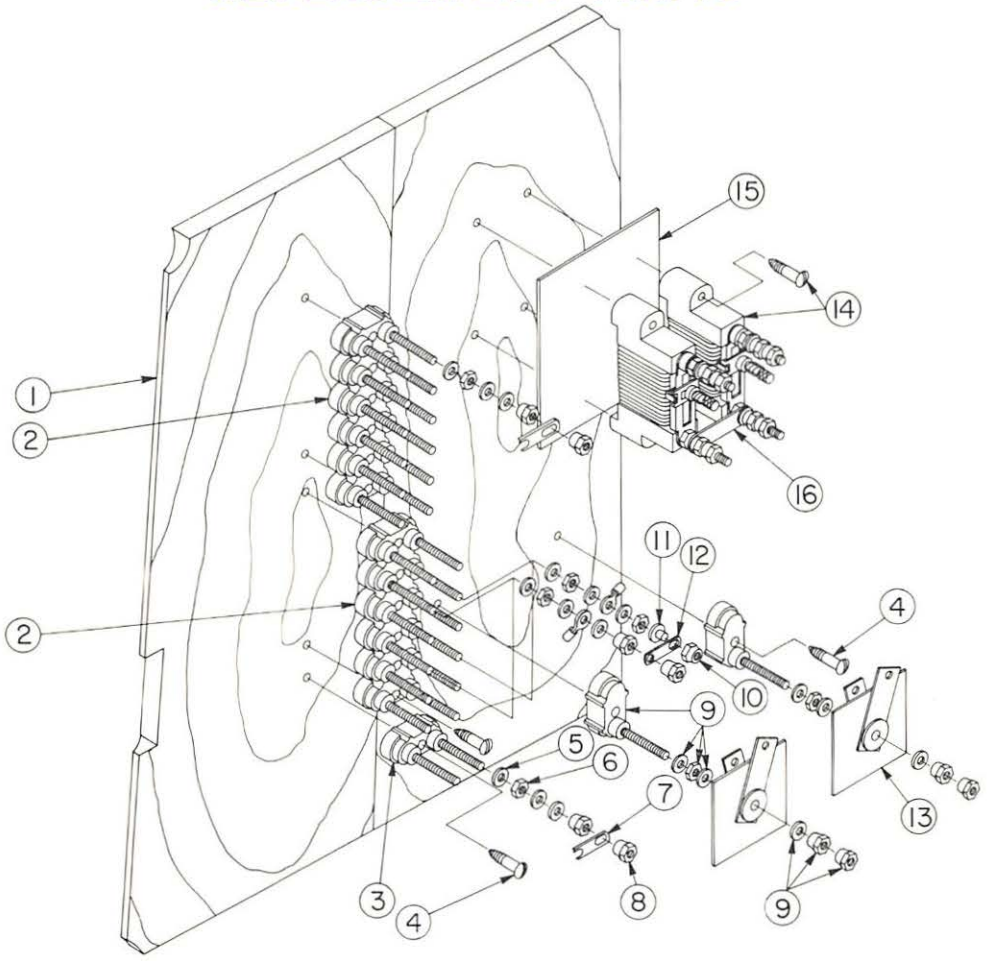
CONTROLLER ASSEMBLY REPLACEMENT PARTS



For complete assembly, order part number 075150-X
To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number	Item No.	Description	Qty. Req'd	Part Number
1	Bracket, Controller	1	075151	22	Key, Woodruff, #3	2	1705
2	Bushing	2	075152	23	Pin, Cotter, 3/32" x 1"	2	1009-SC
3	Shaft, Controller	1	075153	24	Finger, Contact	11	075169-2X
4	Strip, Terminal	4	075165-5X	25	Finger, Contact	11	075170-3X
5	Cam, Motor Switch	1	075155	26	Switch, Double Finger Snap	1	075168-X
6	Cam, Controller	9	075154-X	27	Finger, Contact	2	075170-1X
7	Cam, Solenoid	1	075154-1X	28	Nut, Binding	52	023831
8	Cam, Rectifier	1	075154-2X	29	Washer, Beveled	52	023834
9	Controller, Driven Arm	1	075181	30	Cup, Oil	2	075188
10	End, Rod, Left Hand	1	075183-1	31	Cap Screw, Socket Head, 5/16"-18 x .75"	8	4044-SSC
11	Nut, Hex, Left Hand, 7/16"-20	1	2363-SC				
12	Rod, Connecting	1	075184	32	Nut, Flex Loc, #10-24	1	2315-FLSC
13	Nut, Hex, Right Hand, 7/16"-20	1	2107-SC	33	Post, Binding	28	023274-44
14	End, Rod, Right Hand	1	075183	34	Cap Screw, Hex Head, 5/16"-18 x 1.25"	1	4047-HSC
15	Pin, Connecting Rod End	2	075182				
16	Pin, 3/16"	1	075161	35	Cap Screw, Hex Head, 5/16"-18 x 1.5"	2	4048-HSC
17	Ring, Snap	1	7565				
18	Pin, Spring Guide, 1/8"	1	075159	36	Washer, Spring Lock, 5/16"	2	1809-SC
19	Guide, Spring	1	075158	37	Washer, Spring Lock, M, 1/4"	1	1808-MSC
20	Pawl	1	075160-1	38	Cap Screw, Hex Head, 1/4"-20 x 1.25"	1	4005-HSC
21	Spring	1	075157				

TERMINAL BOARD ASSEMBLY REPLACEMENT PARTS

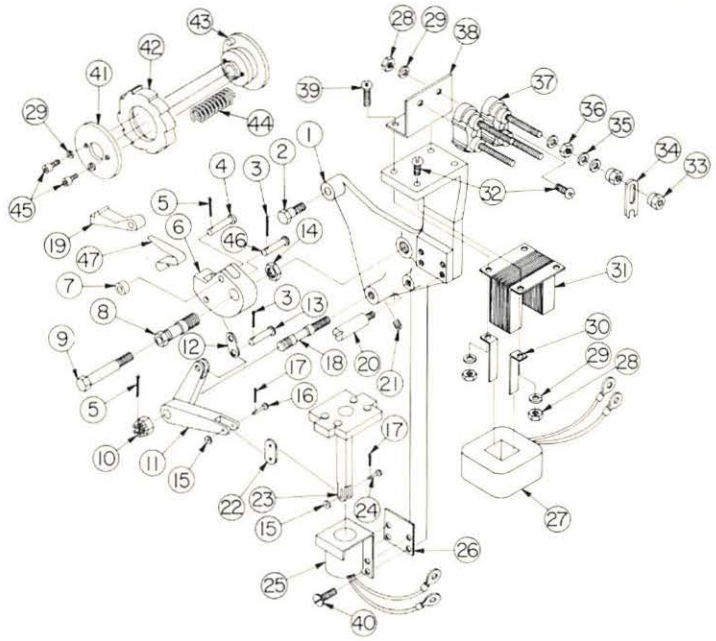


For complete assembly, order part number 075543-X.

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number
1	Lining Assembly	1	075543-LX
2	Block, Terminal	2	023274-1X
3	Block, Terminal	1	023274-24X
4	Wood Screw, Round Head, #10 x 1.25"	7	5733-R
5	Washer, Beveled	78	023834
6	Nut, Clamp	26	023832
7	Connector, Terminal	13	023837
8	Nut, Binding	52	023831
9	Reworked Terminal Post Assembly	2	023274-47X
10	Nut, Test	2	024620-13
11	Bushing, Insulating	2	024620-12
12	Link, Test	2	024620-11
13	Rectifier	2	075543-2
14	Resistor, Adjustable	2	029602-3X
15	Sheet, Insulating	1	075560
16	Connector, Long	1	023839-22

HOLD CLEAR ASSEMBLY REPLACEMENT PARTS

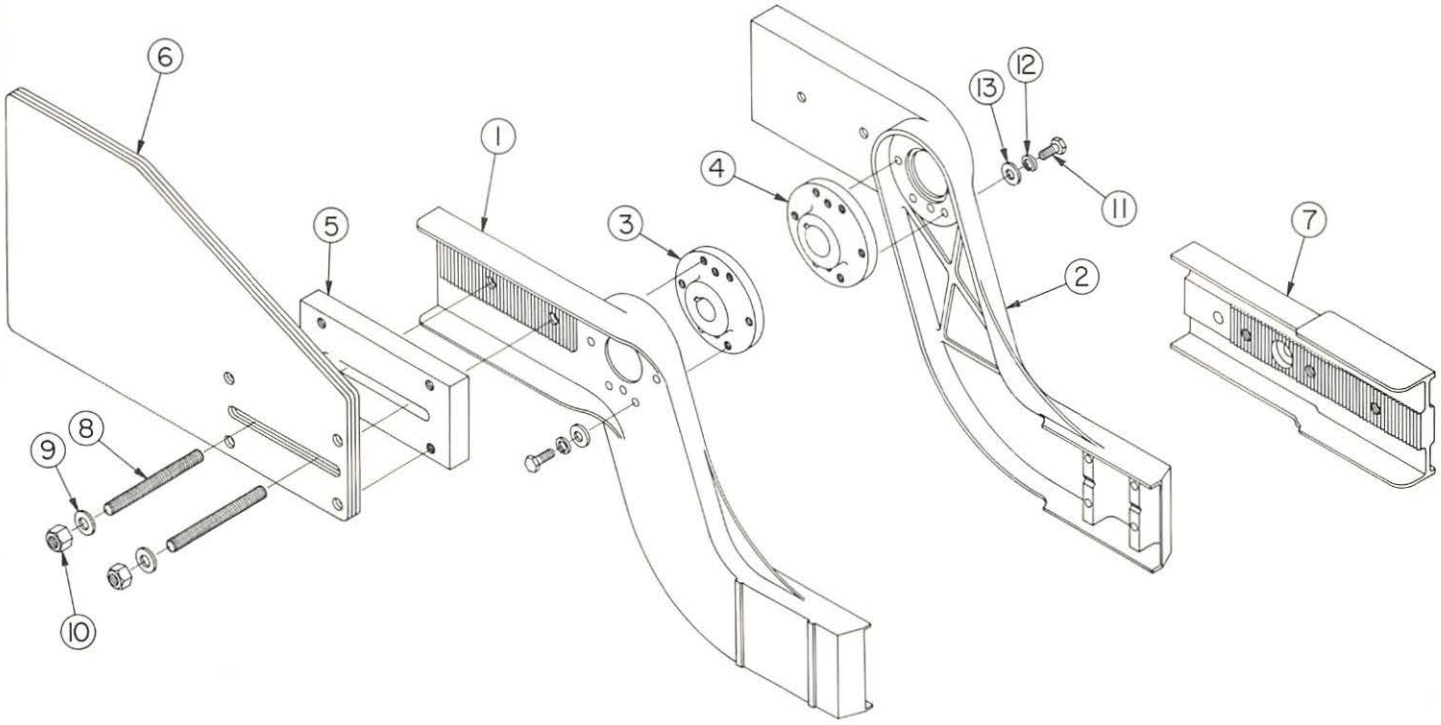


For complete assembly, order part number 075040-X

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number	Item No.	Description	Qty. Req'd	Part Number
1	Bracket, Mounting	1	075047	26	Spacer, Solenoid	1	075079
2	Bolt, Mounting	1	075084	27	Coil, Magnet	1	075086-2X
3	Pin, Cotter, 3/64" x .5"	2	1088-SC	28	Nut, Hex, #10 - 24	6	2014-SC
4	Pin, Pawl	1	075050	29	Washer, Spring Lock, #10	8	1806-SC
5	Pin, Cotter, 1/16" x 1"	1	1002-E	30	Retainer, Coil	2	075080
6	Holder, Pawl	1	075053-1	31	Core, Magnet	1	075087-X
7	Nut, Pawl Pin	1	075051	32	Machine Screw, Round Head, #10 - 24 x .75"	4	2595-SC
8	Stud, Pawl Holder	1	075058				
9	Bolt, Mounting	1	075085	33	Nut, Binding	8	023831
10	Nut, Castle, 3/8" - 24	1	2361-SC	34	Connector	2	023837
11	Crank, Bell	1	075056	35	Washer, Beveled	12	023834
12	Link, Ratchet	1	075055	36	Nut, Clamp	4	023832
13	Pin, Link, Ratchet	1	075061	37	Block, Terminal	2	023274-24X
14	Nut, Pawl Holder Stud	1	075059	38	Bracket	1	075081
15	Washer, Flat, #5	4	1703-B	39	Machine Screw, Round Head, #10 - 24 x .875"	2	2596-SC
16	Pin, Link, Solenoid	1	075062				
17	Pin, Cotter, 1/32" x .5"	2	1087-SC	40	Machine Screw, Flat Head, #8 - 32 x .875"	4	2578-FB
18	Stud, Bell Crank	1	075064				
19	Pawl	1	075049	41	Washer, Ratchet	1	075042
20	Pin, Stop	1	075065	42	Wheel, Ratchet	1	075041
21	Set Screw, Socket Head, #8 - 32 x .25"	2	4558-SC	43	Hub, Ratchet	1	075043-X
				44	Spring	1	075046
22	Link	1	075057	45	Cap Screw, Socket Head, #10 - 32 x .875"	2	7748-SSC
23	Magnet Bar & Plunger	1	075066-X				
24	Pin, Link, Plunger	1	075063	46	Pin, Pawl Holder Link	1	075060
25	Solenoid	1	075072-X	47	Spring, Pawl	3	075054
NOTE: Ratchet Wheel Assembly includes items 29, 41, 42, 43, 44, and 45				48	Ratchet Wheel Assembly	REF	075041-X

GATE ARM SUPPORTS/COUNTERWEIGHTS REPLACEMENT PARTS

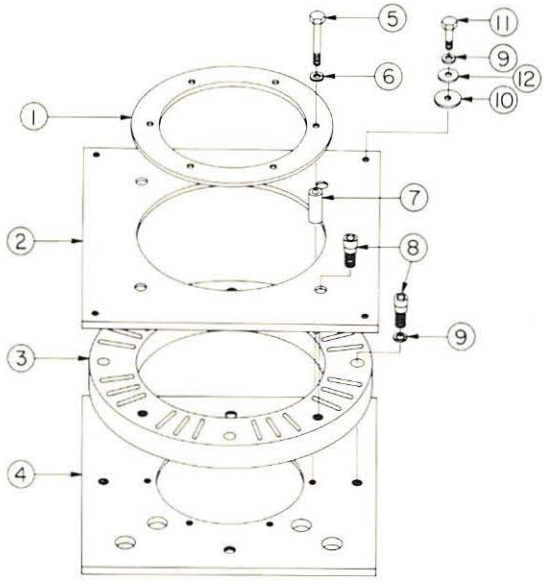


To Order: Specify Description and Part Number.

Item No.	Description	Part Number
1	Support, Right Hand Gate Arm	075402-R
2	Support, Left Hand Gate Arm	075402-L
3	Hub, Right Hand Gate Arm Support	075401-R
4	Hub, Left Hand Gate Arm Support	075401-L
5	Block, Cast	075405
6	Counterweight 32.5 lbs.	075407-1
7	Casting, Extension	075404
8	Stud, 4.75"	075408-2
	Stud, 7.25"	075408
	Stud, 9.25"	075408-1
9	Washer, Flat, 3/4"	1758-C
10	Nut, Hex, 3/4"-10	2114-SC
11	Cap Screw, Hex Head, 1/2"-13 x 1.75"	4169-HSC
12	Washer, Spring Lock, M, 1/2"	1812-MSC
13	Washer, Flat, 1/2"	1731-SC

PEDESTAL TURNTABLE ASSEMBLY REPLACEMENT PARTS

To Order: Specify Description and Part Number.

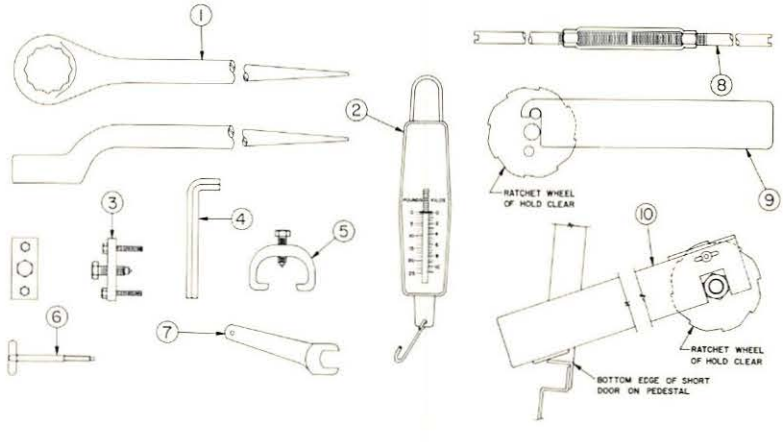


Item No.	Description	Qty. Req'd	Part Number
1	Plate, Retainer	1	075549
2	Plate, Top	1	075548
3	Turntable	1	075546
4	Plate, Base	1	075547
5	Cap Screw, Hex Head, 1/2"-20 x 3.5"	6	4195-HSC
6	Washer, Spring Lock, M, 1/2"	6	1812-MSC
7	Spacer, Retainer Plate	6	075550
8	Cap Screw, Socket Head, 3/4" - 10 x 1.25"	8	4271-SSC
9	Washer, Spring Lock, M, 3/4"	8	1815-MSC
10	Washer, Spacer	4	1737-SC
11	Cap Screw, Hex Head, 3/4"-10 x 1.25"	4	4271-HSC
12	Washer, Flat, 3/4"	4	1758-C

MODEL EM GATE MAINTENANCE TOOLS

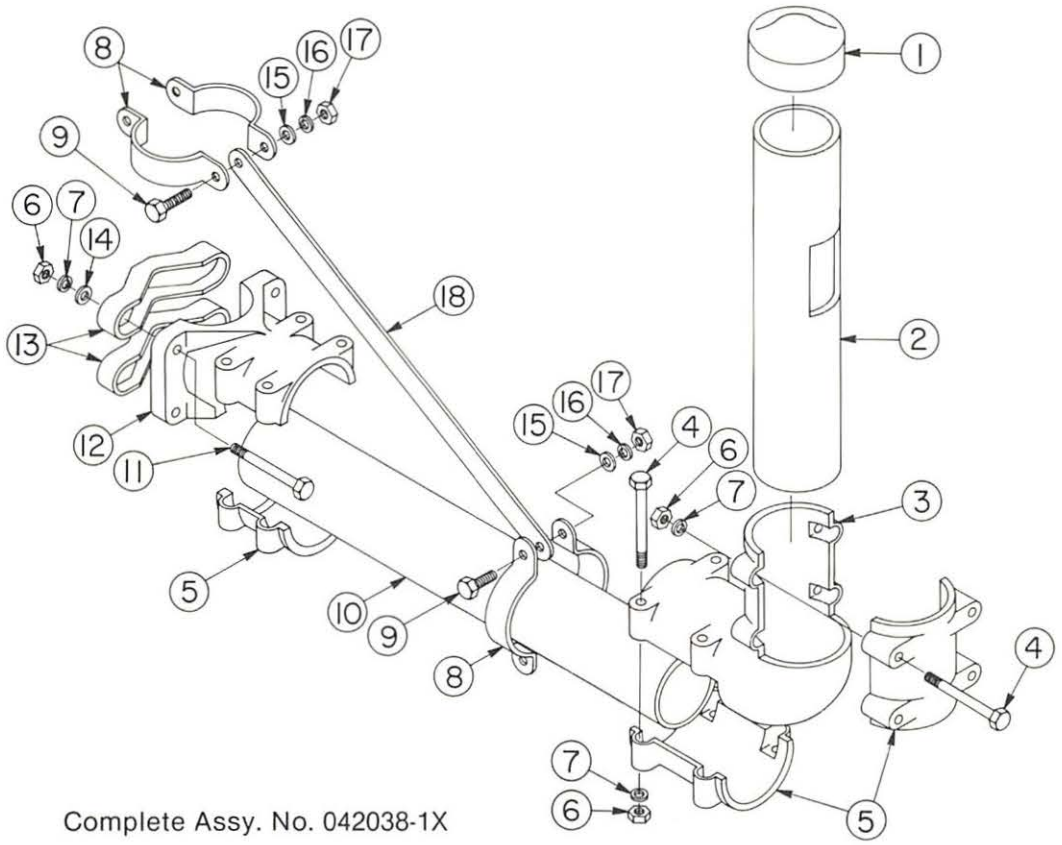
To Order: Specify Description and Part Number.

Item No.	Description	Part Number
1	Wrench, Main Shaft Nut	075989
2	Scale, Torque	075990
3	Puller, Gate Arm Support Hub	075981-X
4	Wrench, Allen, 5/8"	7653
5	Puller, Ratchet Wheel	075984-X
6	Wrench, Controller Cam Adjusting	075978-X
7	Wrench, Buffer	075976
8	Spreader, Gate Arm Support	075975-X
9	Holder, Ratchet Wheel	075986
10	Holder, Gate Arm	075977-X



Note: Items 6 and 7 are furnished with each complete Model EM Pedestal Assembly ordered.

SIDELIGHT CANTILEVER ASSEMBLY REPLACEMENT PARTS

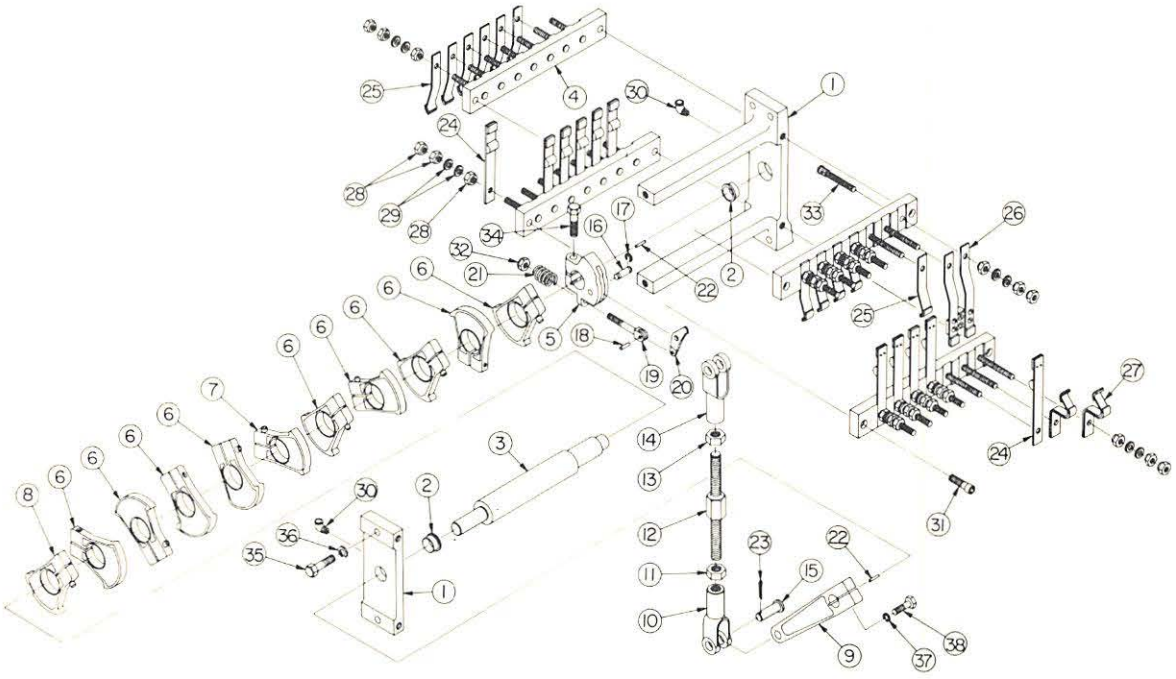


Complete Assy. No. 042038-1X

To Order: Specify Description and Part Number.

Item No.	Description	Quantity Required	Part Number
1	Pinnacle	1	035045-503X
2	Mast, Vertical	1	042048-1
3	Clamp, Sidelight Elbow	1	042035
4	Cap Screw, Hex Head, 5/8"-11 x 5"	12	4250-HSC
5	Clamp, Sidelight	3	042036
6	Nut, Hex, 5/8"-11	16	2112-SC
7	Washer, Spring Lock, M, 5/8"	16	1814-MSC
8	Clamp, Sidelight Support	4	042039
9	Cap Screw, Hex Head, 1/2"-13 x 2.25"	4	4171-HSC
10	Mast, Horizontal	1	042040
11	Cap Screw, Hex Head, 5/8"-11 x 4.5"	4	4249-HSC
12	Clamp, Mast	1	042037
13	Saddle	2	042007
14	Washer, Flat, 5/8"	4	1757-C
15	Washer, Flat, 1/2"	4	1730-SC
16	Washer, Spring Lock, M, 1/2"	4	1812-MSC
17	Nut, Hex, 1/2"-13	4	2108-SC
18	Strap Support	1	042042

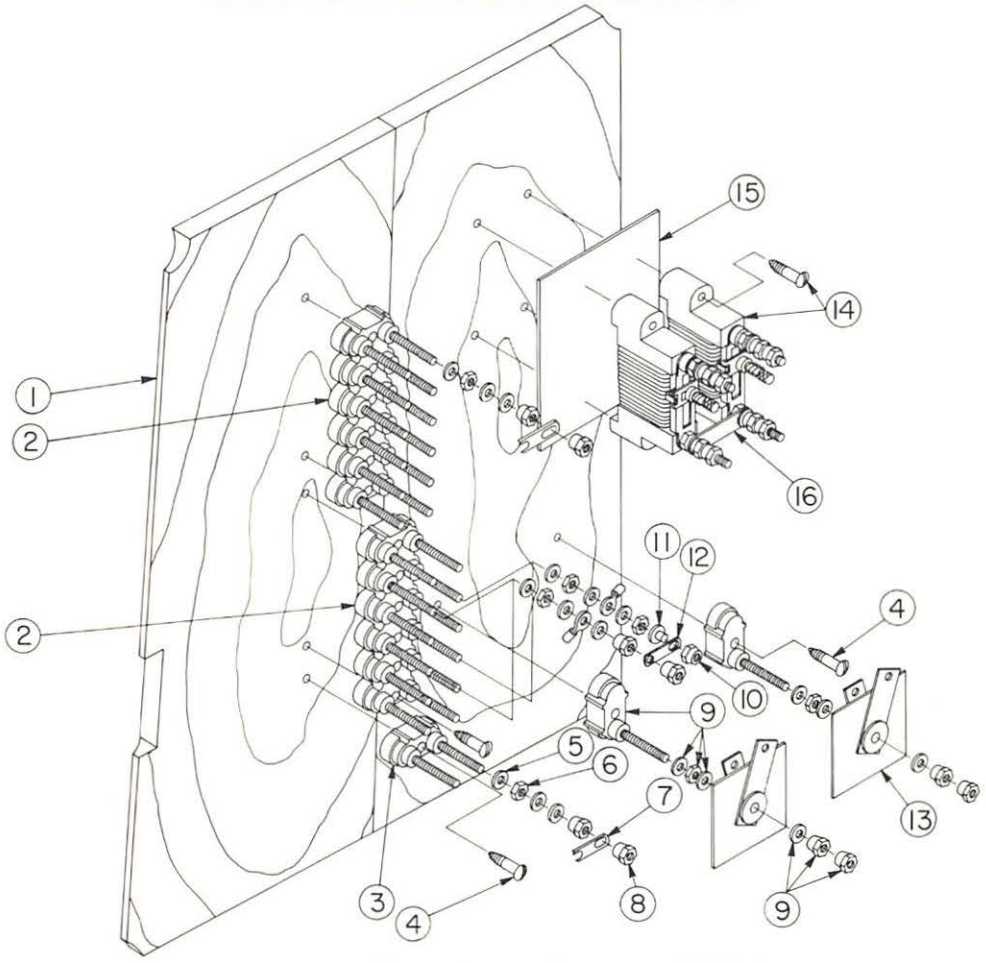
CONTROLLER ASSEMBLY REPLACEMENT PARTS



For complete assembly, order part number 075150-X
To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number	Item No.	Description	Qty. Req'd	Part Number
1	Bracket, Controller	1	075151	22	Key, Woodruff, #3	2	1705
2	Bushing	2	075152	23	Pin, Cotter, 3/32" x 1"	2	1009-SC
3	Shaft, Controller	1	075153	24	Finger, Contact	11	075169-2X
4	Strip, Terminal	4	075165-5X	25	Finger, Contact	11	075170-3X
5	Cam, Motor Switch	1	075155	26	Switch, Double Finger Snap	1	075168-X
6	Cam, Controller	9	075154-X	27	Finger, Contact	2	075170-1X
7	Cam, Solenoid	1	075154-1X	28	Nut, Binding	52	023831
8	Cam, Rectifier	1	075154-2X	29	Washer, Beveled	52	023834
9	Controller, Driven Arm	1	075181	30	Cup, Oil	2	075188
10	End, Rod, Left Hand	1	075183-1	31	Cap Screw, Socket Head, 5/16"-18 x .75"	8	4044-SSC
11	Nut, Hex, Left Hand, 7/16"-20	1	2363-SC				
12	Rod, Connecting	1	075184	32	Nut, Flex Loc, #10-24	1	2315-FLSC
13	Nut, Hex, Right Hand, 7/16"-20	1	2107-SC	33	Post, Binding	28	023274-44
14	End, Rod, Right Hand	1	075183	34	Cap Screw, Hex Head, 5/16"-18 x 1.25"	1	4047-HSC
15	Pin, Connecting Rod End	2	075182				
16	Pin, 3/16"	1	075161	35	Cap Screw, Hex Head, 5/16"-18 x 1.5"	2	4048-HSC
17	Ring, Snap	1	7565				
18	Pin, Spring Guide, 1/8"	1	075159	36	Washer, Spring Lock, 5/16"	2	1809-SC
19	Guide, Spring	1	075158	37	Washer, Spring Lock, M, 1/4"	1	1808-MSC
20	Pawl	1	075160-1	38	Cap Screw, Hex Head, 1/4"-20 x 1.25"	1	4005-HSC
21	Spring	1	075157				

TERMINAL BOARD ASSEMBLY REPLACEMENT PARTS

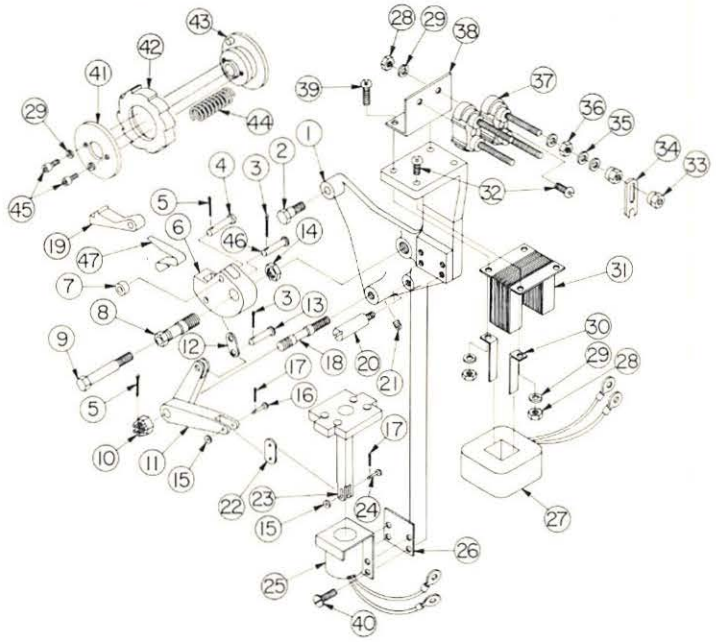


For complete assembly, order part number 075543-X.

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number
1	Lining Assembly	1	075543-LX
2	Block, Terminal	2	023274-1X
3	Block, Terminal	1	023274-24X
4	Wood Screw, Round Head, #10 x 1.25"	7	5733-R
5	Washer, Beveled	78	023834
6	Nut, Clamp	26	023832
7	Connector, Terminal	13	023837
8	Nut, Binding	52	023831
9	Reworked Terminal Post Assembly	2	023274-47X
10	Nut, Test	2	024620-13
11	Bushing, Insulating	2	024620-12
12	Link, Test	2	024620-11
13	Rectifier	2	075543-2
14	Resistor, Adjustable	2	029602-3X
15	Sheet, Insulating	1	075560
16	Connector, Long	1	023839-22

HOLD CLEAR ASSEMBLY REPLACEMENT PARTS

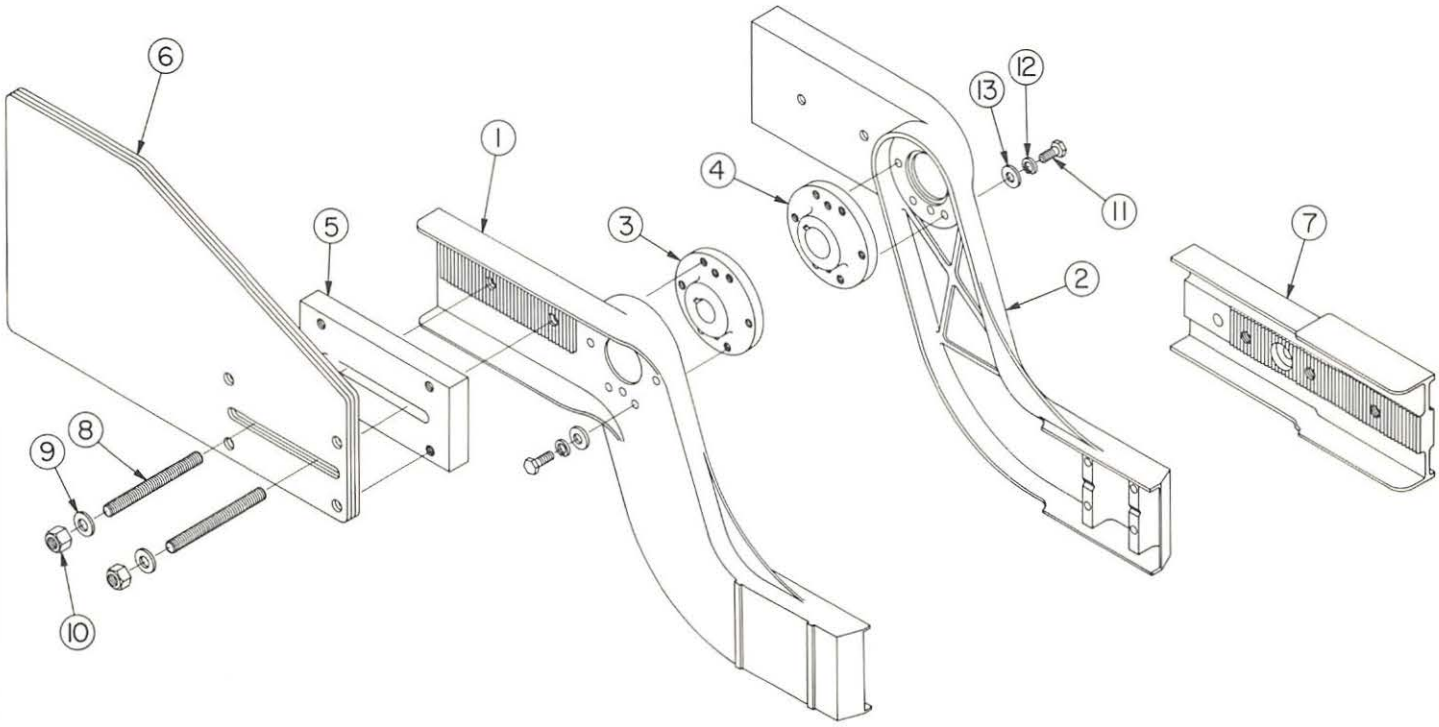


For complete assembly, order part number 075040-X

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number	Item No.	Description	Qty. Req'd	Part Number
1	Bracket, Mounting	1	075047	26	Spacer, Solenoid	1	075079
2	Bolt, Mounting	1	075084	27	Coil, Magnet	1	075086-2X
3	Pin, Cotter, 3/64" x .5"	2	1088-SC	28	Nut, Hex, #10 - 24	6	2014-SC
4	Pin, Pawl	1	075050	29	Washer, Spring Lock, #10	8	1806-SC
5	Pin, Cotter, 1/16" x 1"	1	1002-E	30	Retainer, Coil	2	075080
6	Holder, Pawl	1	075053-1	31	Core, Magnet	1	075087-X
7	Nut, Pawl Pin	1	075051	32	Machine Screw, Round Head, #10 - 24 x .75"	4	2595-SC
8	Stud, Pawl Holder	1	075058				
9	Bolt, Mounting	1	075085	33	Nut, Binding	8	023831
10	Nut, Castle, 3/8" - 24	1	2361-SC	34	Connector	2	023837
11	Crank, Bell	1	075056	35	Washer, Beveled	12	023834
12	Link, Ratchet	1	075055	36	Nut, Clamp	4	023832
13	Pin, Link, Ratchet	1	075061	37	Block, Terminal	2	023274-24X
14	Nut, Pawl Holder Stud	1	075059	38	Bracket	1	075081
15	Washer, Flat, #5	4	1703-B	39	Machine Screw, Round Head, #10 - 24 x .875"	2	2596-SC
16	Pin, Link, Solenoid	1	075062				
17	Pin, Cotter, 1/32" x .5"	2	1087-SC	40	Machine Screw, Flat Head, #8 - 32 x .875"	4	2578-FB
18	Stud, Bell Crank	1	075064				
19	Pawl	1	075049	41	Washer, Ratchet	1	075042
20	Pin, Stop	1	075065	42	Wheel, Ratchet	1	075041
21	Set Screw, Socket Head, #8 - 32 x .25"	2	4558-SC	43	Hub, Ratchet	1	075043-X
				44	Spring	1	075046
22	Link	1	075057	45	Cap Screw, Socket Head, #10 - 32 x .875"	2	7748-SSC
23	Magnet Bar & Plunger	1	075066-X				
24	Pin, Link, Plunger	1	075063	46	Pin, Pawl Holder Link	1	075060
25	Solenoid	1	075072-X	47	Spring, Pawl	3	075054
NOTE: Ratchet Wheel Assembly includes items 29, 41, 42, 43, 44, and 45				48	Ratchet Wheel Assembly	REF	075041-X

GATE ARM SUPPORTS/COUNTERWEIGHTS REPLACEMENT PARTS

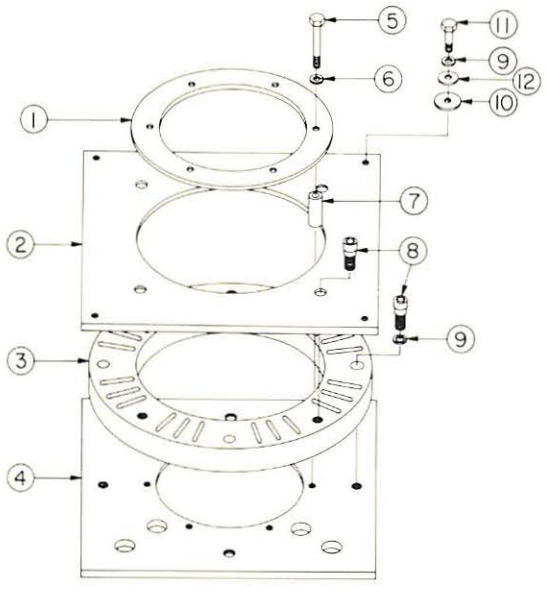


To Order: Specify Description and Part Number.

Item No.	Description	Part Number
1	Support, Right Hand Gate Arm	075402-R
2	Support, Left Hand Gate Arm	075402-L
3	Hub, Right Hand Gate Arm Support	075401-R
4	Hub, Left Hand Gate Arm Support	075401-L
5	Block, Cast	075405
6	Counterweight 32.5 lbs.	075407-1
7	Casting, Extension	075404
8	Stud, 4.75"	075408-2
	Stud, 7.25"	075408
	Stud, 9.25"	075408-1
9	Washer, Flat, 3/4"	1758-C
10	Nut, Hex, 3/4"-10	2114-SC
11	Cap Screw, Hex Head, 1/2"-13 x 1.75"	4169-HSC
12	Washer, Spring Lock, M, 1/2"	1812-MSC
13	Washer, Flat, 1/2"	1731-SC

PEDESTAL TURNTABLE ASSEMBLY REPLACEMENT PARTS

To Order: Specify Description and Part Number.

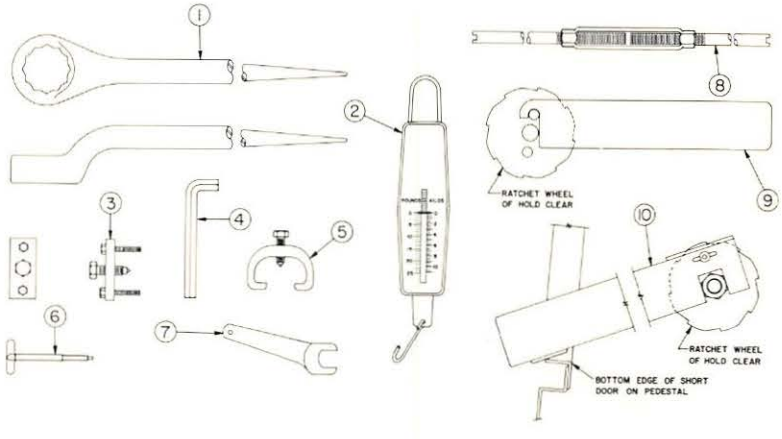


Item No.	Description	Qty. Req'd	Part Number
1	Plate, Retainer	1	075549
2	Plate, Top	1	075548
3	Turntable	1	075546
4	Plate, Base	1	075547
5	Cap Screw, Hex Head, 1/2"-20 x 3.5"	6	4195-HSC
6	Washer, Spring Lock, M, 1/2"	6	1812-MSC
7	Spacer, Retainer Plate	6	075550
8	Cap Screw, Socket Head, 3/4" - 10 x 1.25"	8	4271-SSC
9	Washer, Spring Lock, M, 3/4"	8	1815-MSC
10	Washer, Spacer	4	1737-SC
11	Cap Screw, Hex Head, 3/4"-10 x 1.25"	4	4271-HSC
12	Washer, Flat, 3/4"	4	1758-C

MODEL EM GATE MAINTENANCE TOOLS

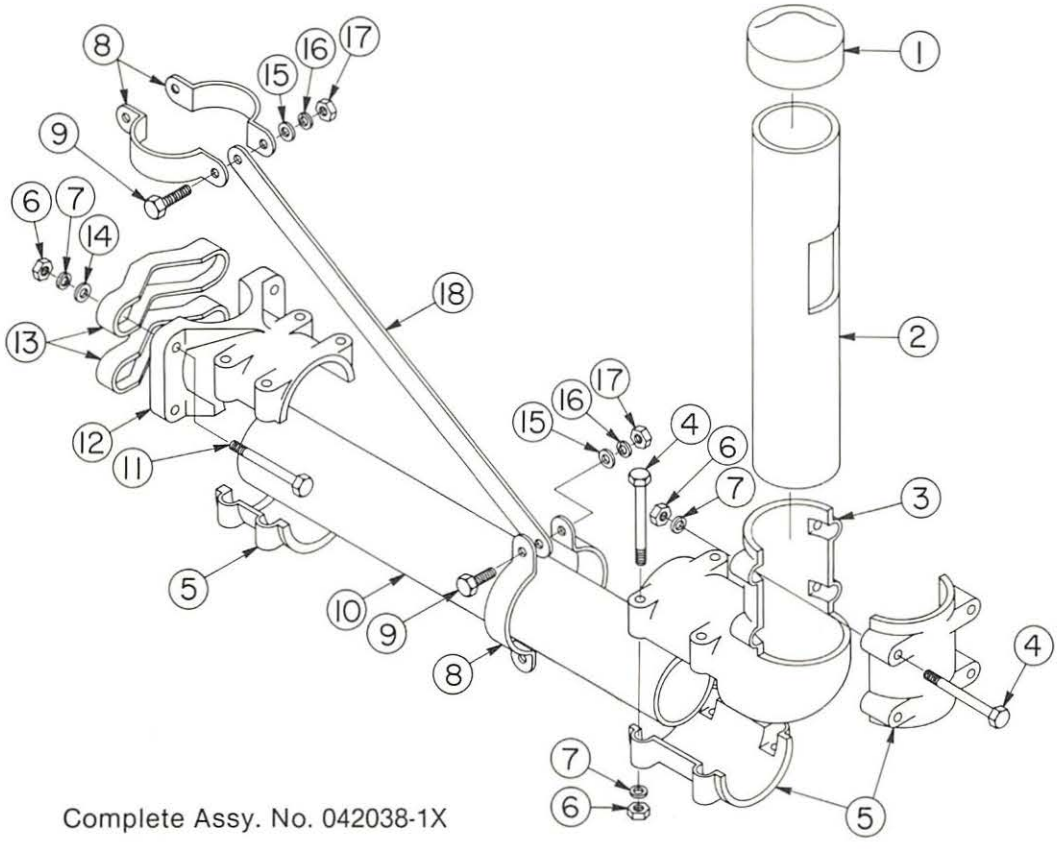
To Order: Specify Description and Part Number.

Item No.	Description	Part Number
1	Wrench, Main Shaft Nut	075989
2	Scale, Torque	075990
3	Puller, Gate Arm Support Hub	075981-X
4	Wrench, Allen, 5/8"	7653
5	Puller, Ratchet Wheel	075984-X
6	Wrench, Controller Cam Adjusting	075978-X
7	Wrench, Buffer	075976
8	Spreader, Gate Arm Support	075975-X
9	Holder, Ratchet Wheel	075986
10	Holder, Gate Arm	075977-X



Note: Items 6 and 7 are furnished with each complete Model EM Pedestal Assembly ordered.

SIDELIGHT CANTILEVER ASSEMBLY REPLACEMENT PARTS



Complete Assy. No. 042038-1X

To Order: Specify Description and Part Number.

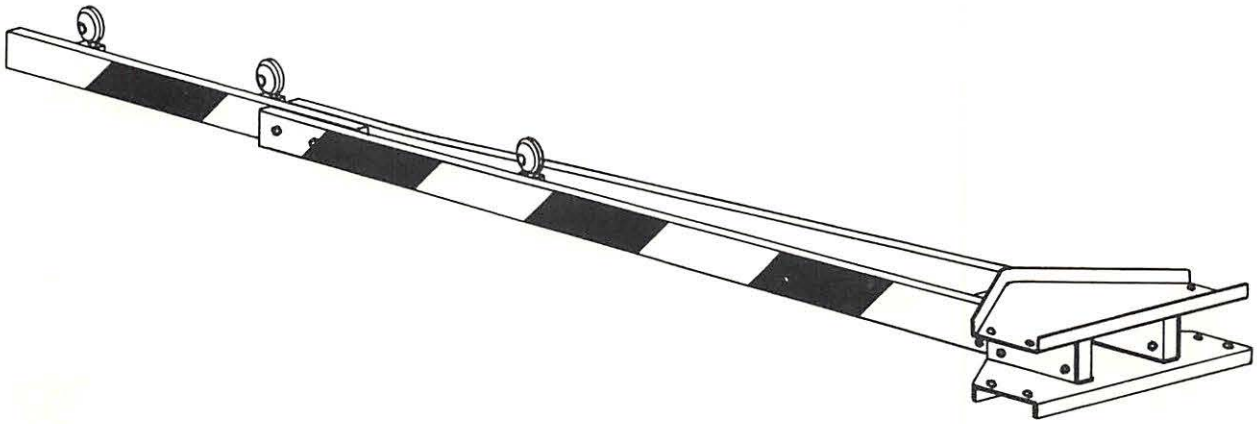
Item No.	Description	Quantity Required	Part Number
1	Pinnacle	1	035045-503X
2	Mast, Vertical	1	042048-1
3	Clamp, Sidelight Elbow	1	042035
4	Cap Screw, Hex Head, 5/8"-11 x 5"	12	4250-HSC
5	Clamp, Sidelight	3	042036
6	Nut, Hex, 5/8"-11	16	2112-SC
7	Washer, Spring Lock, M, 5/8"	16	1814-MSC
8	Clamp, Sidelight Support	4	042039
9	Cap Screw, Hex Head, 1/2"-13 x 2.25"	4	4171-HSC
10	Mast, Horizontal	1	042040
11	Cap Screw, Hex Head, 5/8"-11 x 4.5"	4	4249-HSC
12	Clamp, Mast	1	042037
13	Saddle	2	042007
14	Washer, Flat, 5/8"	4	1757-C
15	Washer, Flat, 1/2"	4	1730-SC
16	Washer, Spring Lock, M, 1/2"	4	1812-MSC
17	Nut, Hex, 1/2"-13	4	2108-SC
18	Strap Support	1	042042

Safetran

GATE ARMS

FIBERGLASS, FIBERGLASS/ALUMINUM, AND WOOD

WOOD GATE ARMS



Standard Wood Gate Arms are furnished in reflex-reflecting red and white stripes. These arms come in a maximum recommended length of 42 feet (consult with factory for special arm lengths) and include three fixed gate arm lamps completely wired for operation. Base couplings when furnished are for Safetran Types S, SM, SMB or EM mechanisms.

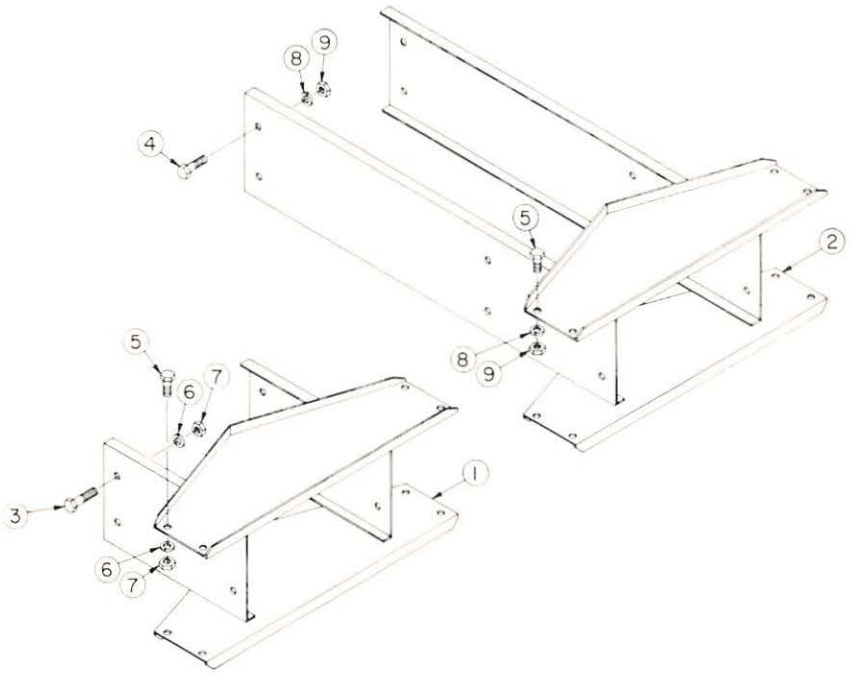
ORDERING INFORMATION

Note: Length of Wood Gate Arms are measured from center of mast to end of arm. Base Couplings must be ordered separately.

To Order: Specify the following:

1. Wood Gate Arm and length desired. (Max. recommended length is 42 feet.)
2. 4 or 7 inch diameter gate arm lamps. (See page A-6-7)
3. Bulb - voltage and wattage. (See page A-7-4)
4. Base coupling. (See page A-6-2)

WOOD GATE ARM REPLACEMENT PARTS



To Order: Specify Description and Part Number.

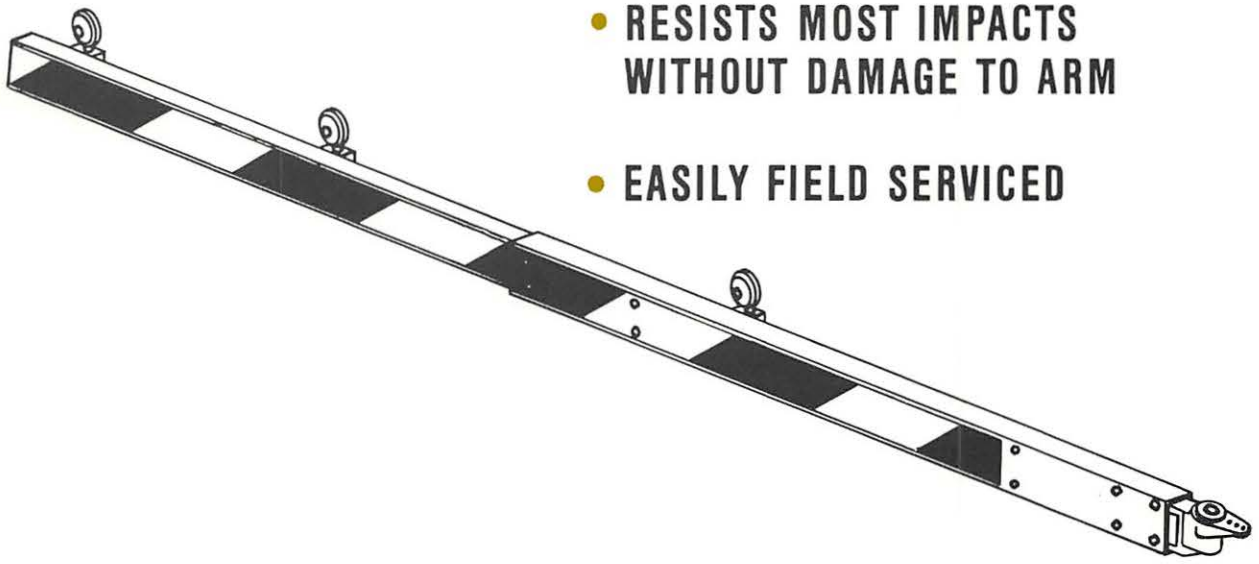
Item Number	Description	Quantity Required	Part Number
1	Coupling, Base, for arms to 30 ft.	1	070583-500X
2	Coupling, Base, for arms 31 ft. and over	1	070583-501X
3	Cap Screw, Hex Head, 1/2"-13 x 1.75"	8	4169-HSC
4	Cap Screw, Hex Head, 1/2"-13 x 2.50"	12	4172-HSC
5	Cap Screw, Hex Head, 1/2"-13 x 1.25"	8	4167-HSC
6	Washer, Spring Lock, M, 1/2"	16	1812-MSC
7	Nut, Hex, 1/2"-13	16	2108-SC
8	Washer, Spring Lock, M, 1/2"	20	1812-MSC
9	Nut, Hex, 1/2"-13	20	2108-SC

Ordering information for replacement of individual boards of gate arm, furnished in reflex-reflecting red and white stripes, will be furnished upon request.

The above Base Couplings are designed for the mounting of wood gate arms to the Models S, SM and SMB gate mechanisms. A Base Coupling is not required for the mounting of wood gate arms to the Model EM gate mechanism.

FIBERGLASS AND FIBERGLASS/ALUMINUM GATE ARMS

- BREAKAWAY BASE COUPLING
- RESISTS MOST IMPACTS WITHOUT DAMAGE TO ARM
- EASILY FIELD SERVICED



Safetran Fiberglass and Fiberglass/Aluminum Gate Arms feature high strength long lasting materials, and are light enough for one man installation. Both the Fiberglass and Fiberglass/Aluminum gate arms feature breakaway mounting adapters. The adapters are designed such that any excessive force against the gate arm will cause the adapters shear bolts to shear allowing the arm to swing free and drop away, thus preventing major damage to the arm.

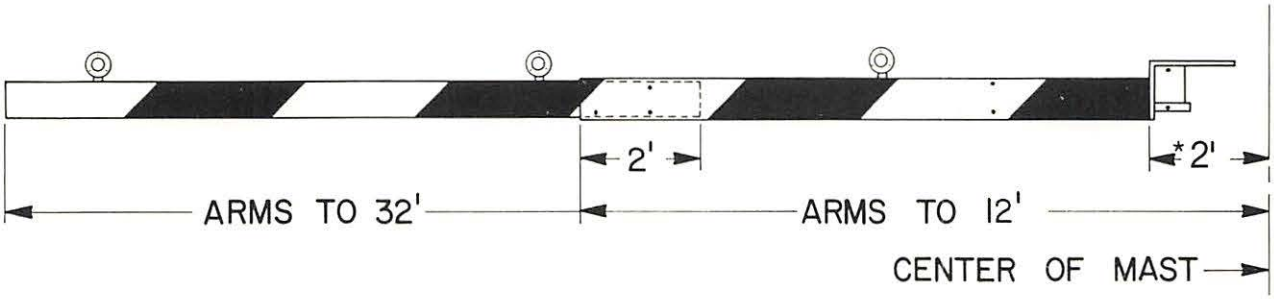
In order to insure maximum visibility there are three red lensed gate arm lamps mounted on the arm. In addition, the arm is striped a red and white reflex-reflecting material.

Fiberglass gate arms are made of glass fibers and polyester resin by means of a pultrusion process. These arms are made up of two telescoping sections. They provide high strength and are uneffected by weather and atmosphere.

The Fiberglass/Aluminum gate arms are composed of a base section of rectangular shaped extruded aluminum and a second section of pultruded fiberglass. The second or end section is electrically nonconducting fiberglass to prevent the short circuiting of overhead wires. These gate arms are extremely strong, lightweight, and fully telescoping.

The maximum recommended length for these arms is 32 feet.
(Consult with factory for special arm lengths.)

FIBERGLASS AND FIBERGLASS/ALUMINUM GATE ARM ORDERING INFORMATION



*NOTE: Gate arms are supplied to provide specified length from center of mast with 2'0" from mast center to base end of gate arm. Actual dimension from mast center to base of gate arm will vary slightly depending on gate mechanism and adaptor used. Fiberglass arms are supplied with aluminum sleeved base sections. Fiberglass/Aluminum arms have all aluminum base section.

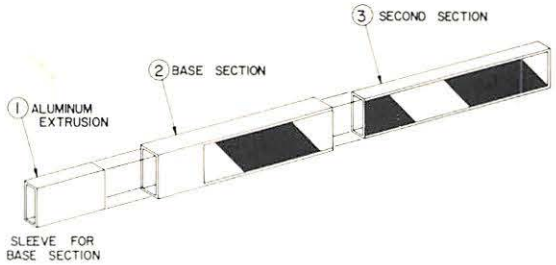
To Order: Specify Description, Type of Arm and Assembly Number.

Description	Type of Arm	
	Fiberglass	Fiberglass/Aluminum
Complete Assembly with cast adapter and 8 pin socket and cord assy.	Assembly Number 076500-##0600	Assembly Number 076600-##0600
Complete Assembly with fabricated adapter and 6 pin socket and cord assy.	Assembly Number 076500-##0601	Assembly Number 076600-##0601

Note: The above assemblies include three 4 inch diameter red lensed gate arm lamps (less bulbs) completely wired for operation, unless otherwise specified.

##-Length of arm in feet

REPLACEMENT PARTS

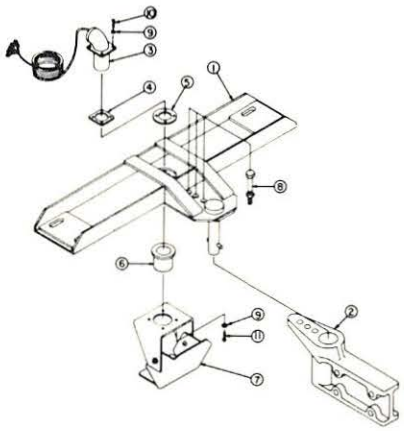


Item No.	Arm Length in Feet	Fiberglass Arms	Fiberglass/ Aluminum Arms
1	12 - 24	076203-4	076203-6
	25 - 32	076203-5	076203-6
2	12 - 20	076250-507X	076250-504X
	21 - 32	076250-506X	076250-505X
3	12 - 16 21 - 24	076251-500X	076251-500X
	17 - 20 25 - 28	076251-502X	076251-502X
	29 - 32	076251-501X	076251-501X

NOTE: No sleeve required for Fiberglass/Aluminum Arms with Fabricated Adapter.
Above Replacement Parts for old style gate arm with 12' base section only.

CONVERSION BRACKET ASSEMBLIES FOR SAFETRAN MODEL S (MAST MOUNTED) GATES

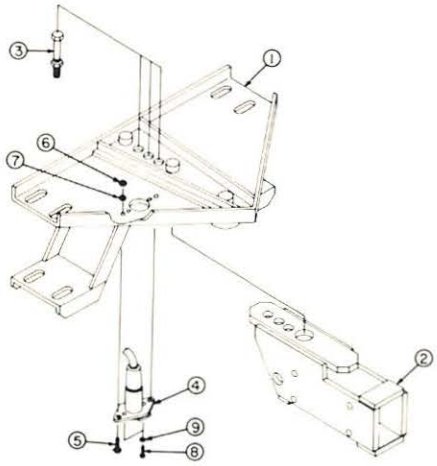
ADAPTABLE TO GATES MANUFACTURED BY GRS AND WESTERN CULLEN HAYES, INC.



Conversion bracket with cast adapter

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number
	Complete Assembly w/HDW (Less Adapter)		076227-513X
1	Bracket, Conversion	1	076227-7X
	Bracket Conversion Mounting Hardware		076227-8X
2	Adapter, Cast	1	076203-510X
3	Socket and Cord Assembly	1	076223-503X
4	Spacer	1	022400-4A
5	Gasket, Spacer	1	076227-8
6	Boot, Rubber	1	076214-1
7	Retainer, Plug	1	076244-2X
8	Shear Bolt Assembly	3	076215-X
9	Washer, Spring Lock, M, #10	8	1806-MSC
10	Machine Screw, Round Head, #10-24 x .75"	4	2595-RSC
11	Machine Screw, Round Head, #10-24 x .4375"	4	2591-RSC

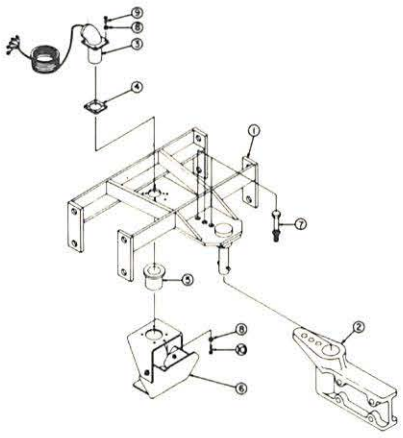


Conversion bracket with fabricated adapter

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number
	Complete Assembly w/HDW (Less Adapter)		076227-22X
1	Bracket, Conversion	1	076227-501AX
	Bracket Conversion Mounting Hardware		076227-35X
2	Adapter, Fabricated	1	076203-510X
3	Shear Bolt Assembly	3	076215-X
4	Socket and Cord Assembly	1	076223-5X
5	Cap Screw, Hex Head, 1/4"-20 x .75"	2	402-HSC
6	Nut, Hex 1/4"-20	2	2100-SC
7	Washer Spring Lock, M, 1/4"	2	1808-MSC
8	Machine Screw, Round Head, #10-24 x .50"	2	2592-RSC
9	Washer, Spring Lock, M, #10	2	1806-MSC

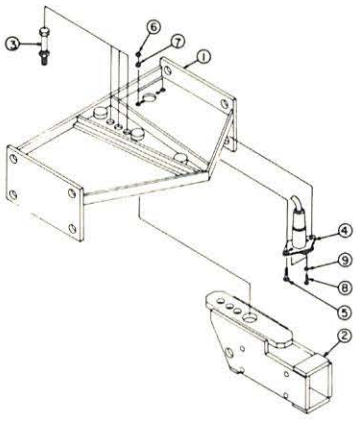
CONVERSION BRACKET ASSEMBLIES FOR SAFETRAN ELECTRO-MECHANICAL (PEDESTAL MOUNTED) GATES



Conversion bracket with cast adapter.

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number
	Complete Assembly w/HDW (Less Adapter)		076225-3X
1	Bracket, Conversion	1	076225-5X
	Bracket Conversion Mounting Hardware		076225-8X
2	Adapter, Cast	1	076203-510X
3	Socket and Cord Assembly	1	076223-503X
4	Spacer	1	022400-4A
5	Boot, Rubber	1	076214-1
6	Retainer, Plug	1	076244-4X
7	Shear Bolt Assembly	3	076215-X
8	Washer, Spring Lock, M, #10	8	1806-MSC
9	Machine Screw, Round Head, #10-24 x .75"	4	2595-RSC
10	Machine Screw, Round Head, #10-24 x .50"	5	2592-RSC

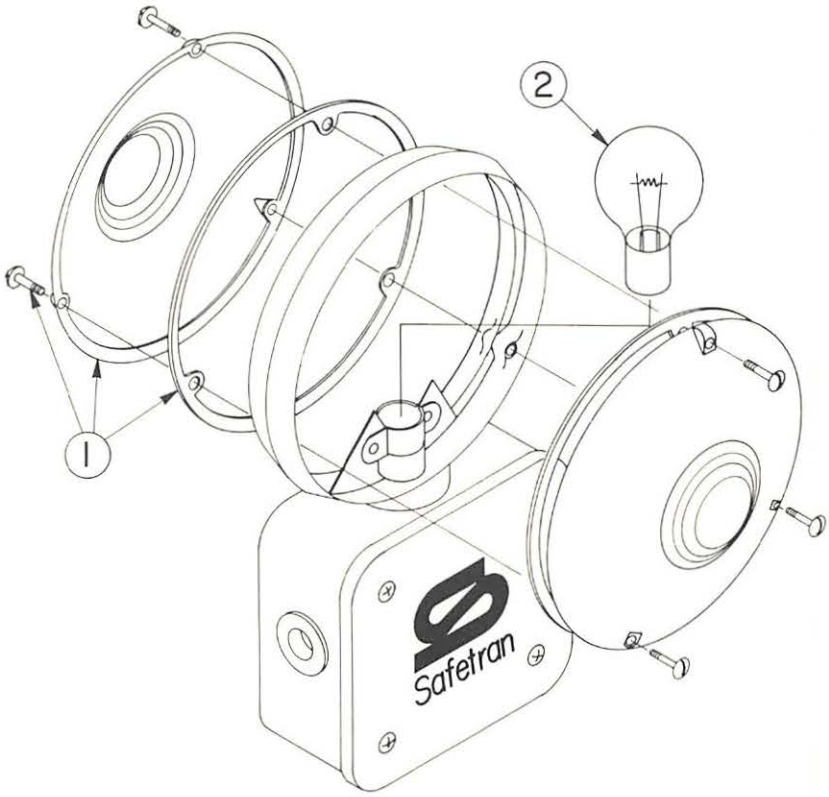


Conversion bracket with fabricated adapter.

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number
	Complete Assembly w/HDW (Less Adapter)		076225-10AX
1	Bracket, Conversion	1	076225-10X
	Bracket Conversion Mounting Hardware		076225-18X
2	Adapter, Fabricated	1	076203-501X
3	Shear Bolt Assembly	3	076215-X
4	Socket and Cord Assembly	1	076223-5X
5	Cap Screw, Hex Head, 1/4"-20 x .75"	2	4022-HSC
6	Nut, Hex 1/4"-20	2	2100-SC
7	Washer Spring Lock, M, 1/4"	2	1808-MSC
8	Machine Screw, Round Head, #10-24 x .50"	2	2592-RSC
9	Washer, Spring Lock, M, #10	2	1806-MSC

GATE ARM LAMPS



Safetran 4 inch diameter Gate Arm Lamp is a standard on all Safetran gate arms. The lamp is available in an optional 7 inch diameter lens type.

To Order: Specify Description and Part Number

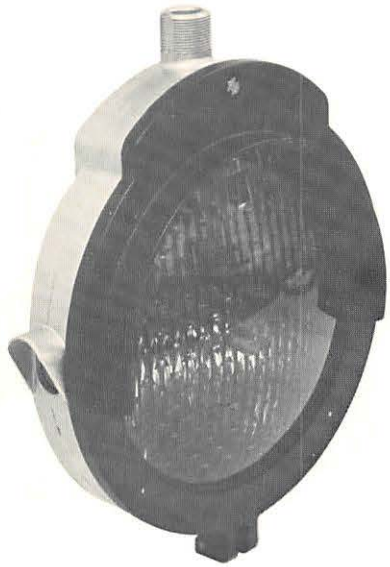
Item Number	Description	Quantity Required	Part Number
	Complete Assy., Less bulb, 4" lenses		075950-500X
	Complete Assy., Less bulb, 7" lenses		075950-502X
1*	Kit, Lense Replacement, 4" lenses	1	075952-500X
1*	Kit, Lense Replacement, 7" lenses	1	075952-509X
2	Bulb, Signal (See page A-7-4)	1	Specified

*Contains 2 lenses, 2 gaskets, and mounting screws.

Safetran

FLASHING LAMPS AND ASSEMBLIES

FLX-10 AND FLX-12



- RUGGED DIE-CAST ALUMINUM CONSTRUCTION
- IMPACT-RESISTANT REFLECTOR AND ROUNDEL
- BULB/SOCKET POSITION FIXED BY DESIGN
- BUILT IN ALIGNMENT SCOPE
- MINIMUM MAINTENANCE REQUIRED

FLX-10 and FLX-12 Flashing Lamps provide a highly intense beam for both distant and close up viewing. The lamp housings are of precision die-cast aluminum construction to provide superior strength and precise optical alignment.

The new die-cast FLX-12 employs an improved reflector and precision lamp bracket. A precision molded plastic reflector, with aluminized and coated front surface for exceptional light output, is reinforced by channel at the other rim for additional dimensional stability. This reflector provides improved light output and optical uniformity over previous glass reflectors. The reflector is essentially unbreakable in normal use.

Factory pre-focussed lamp brackets assure accurate optical alignment. A built-in sighting device allows for proper beam alignment by one person.

The FLX-10 and FLX-12 lamps are designed for top mounting, with easy vertical and horizontal alignment, and quick clamping in the final position. Adapters to all existing lamp brackets are available.

The FLX-10 offers a highly intense light indication through an impact-resistant 8-3/8 inch roundel.

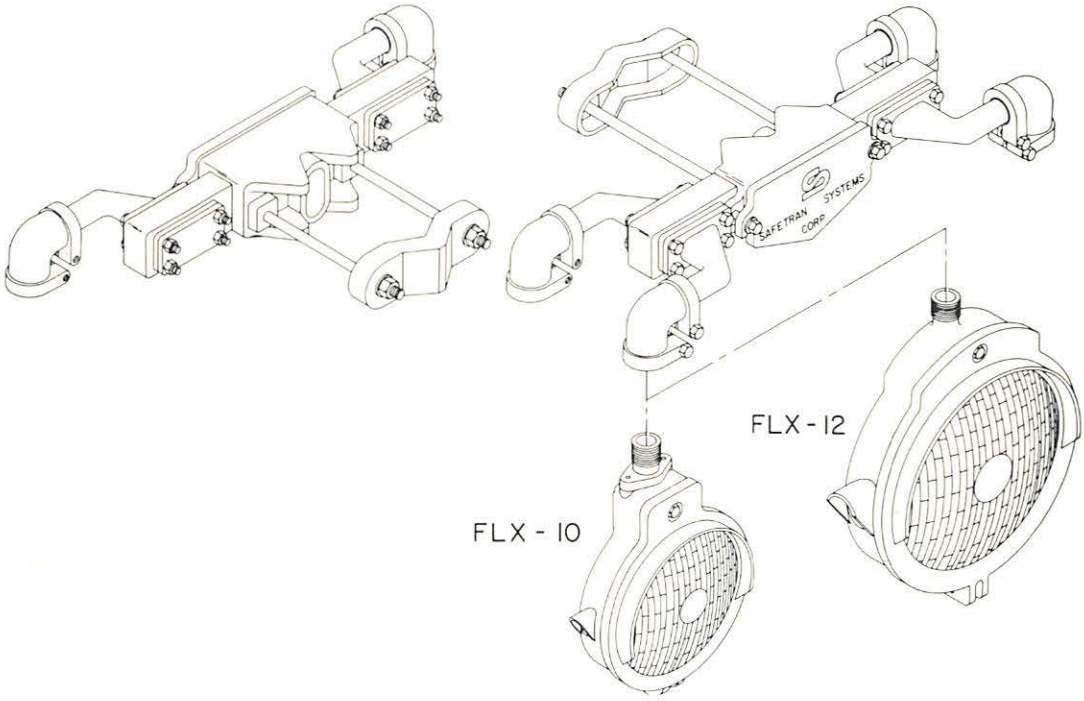
The FLX-12 offers a more visible light indication through an impact-resistant 12 inch roundel when this diameter lamp is specified.

A full range of roundel deflections is available for all crossing configurations.

Background and visor assemblies, of black high-density polyethelene plastic, are furnished with each lamp. Steel and aluminum visors and backgrounds are also available upon request.

Both the FLX-10 and FLX-12 meet or exceed all applicable AAR specifications.

ORDERING INFORMATION



FLX-10 AND FLX-12

To Order: Specify Part Number.

Model	Roundel	Part Number	Model	Roundel	Part Number
FLX-10	30/15	042000-000525	FLX-10	20/32	042000-000516
FLX-12	30/15	042000-000222	FLX-12	20/32	042000-000236

COMPLETE CROSSARM ASSEMBLY WITH FLASHING LAMPS

To Order: Specify Part Number.

Crossarm	Lamp	Mast Size	Roundel	Part Number	Crossarm	Lamp	Mast Size	Roundel	Part Number
2 Way	FLX-10	4"	30/15	042003-000547	2 Way	FLX-12	5"	30/15	042003-000896
1 Way	FLX-10	4"	30/15	042003-000541	1 Way	FLX-12	5"	30/15	042003-000897
2 Way	FLX-12	4"	30/15	042003-000563	2 Way	FLX-10	8"	30/15	042003-000535
1 Way	FLX-12	4"	30/15	042003-000539	1 Way	FLX-10	8"	30/15	042003-000575
2 Way	FLX-10	4"	20/32	042003-000573	2 Way	FLX-12	8"	30/15	042003-000554
1 Way	FLX-10	4"	20/32	042003-000601	1 Way	FLX-12	8"	30/15	042003-000580
2 Way	FLX-12	4"	20/32	042003-000540	2 Way	FLX-10	12"	30/15	042003-000553
1 Way	FLX-12	4"	20/32	042003-000539	1 Way	FLX-10	12"	30/15	042003-000545
2 Way	FLX-10	5"	30/15	042003-000894	2 Way	FLX-12	12"	30/15	042003-000607
1 Way	FLX-10	5"	30/15	042003-000895	1 Way	FLX-12	12"	30/15	042003-000606

Note: Assemblies come with poly backgrounds and visors, 18W bulb.
If different bulb, roundel or background and visor are required, please indicate when ordering.
For special assemblies see page A-7-5 and page A-7-6.

FLASHING LAMP ROUNDELS

Safetran's Flashing Lamp Roundels are designed to provide a full face high intensity warning light for highway crossing signals. They are made of Lexan© plastic to provide maximum impact resistance. Prisms on the face of the roundel are designed for proper deflection and distribution of light over the entire face of the roundel. Additionally, a bright light is created around the outside circumference of the lamphead. This increased coverage produces a more arrestive signal to more motorists.

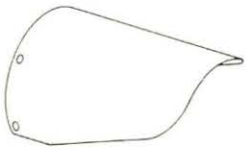
Designed for Safetran's FLX-10 and FLX-12 Flashing Lamps, they are also interchangable with all other flashing lamp units.

All roundels listed in the table below have a chromaticity rating of .320Y.

To Order: Specify Deflection, Diameter in Inches and Part Number.

Deflection		Diameter In Inches	Part Number
Horizontal	Vertical		
20	15	8-3/8	040405-4430
20	32	8-3/8	040405-2530
30	0	8-3/8	040405-2430
30	15	8-3/8	040405-4530
70	0	8-3/8	040405-5130
20	32	12	040405-3930
30	15	12	040405-2230
70	0	12	040405-5030

BACKGROUNDS AND VISORS



Background and Visor Assemblies are constructed of black, high density, polyethylene plastic, aluminum or steel. Their non-reflecting surfaces add to the signal's effectiveness.

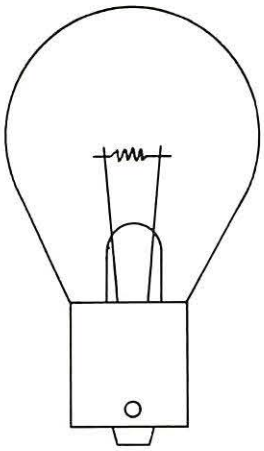
Background, visor (plastic, unless otherwise specified) and associated mounting hardware will be furnished with each lamp ordered.

To Order: Specify Background and Visor Assembly, Lamp Type, and Part Number.

Material	Flashing Lamp Type	Part Number	
		Background	Visor
Polyethylene	FLX-10	042004-9	042005-3
Polyethylene	FLX-12	(20") 042004-10	042005-80
Polyethylene	FLX-12	(24") 042004-27	042005-80
Aluminum	FLX-10	042004-31	044018
Aluminum	FLX-12	(20") 042004-33	042005-103
Aluminum	FLX-12	(24") 042005-32	042005-103
Steel	FLX-10	042004	042005
Steel	FLX-12	(20") 042004-21	042005-30
Steel	FLX-12	(24") 042004-500	042005-30

For mounting hardware for background and visor, order number 042077-500X.

STANDARD SIGNAL BULBS



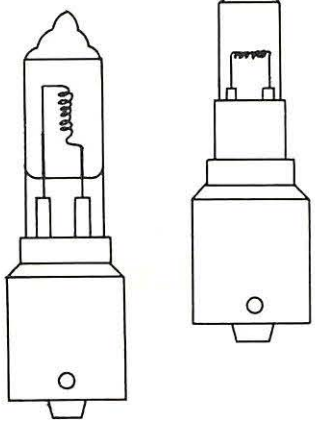
Safetran signal bulbs are S-11 S.C. candelabra base with a CC-6 filament arrangement.

The LCL (light center length) is AAR standard 1-1/4 inches. Average life is 1000 hours at specified operating voltage.

To Order: Specify Voltage, Wattage, and Part Number

Voltage	Wattage	Part Number
10	18	042365
10	25	042365-3
110/120	25	042365-6
10	18/3.5	042365-11

QUARTZ-HALOGEN SIGNAL BULBS



The QI 10-16 and QI 10-36 Quartz-Halogen Signal Bulbs are quartz envelope, halogen gas filled, tungsten filament lamp bulbs.

Both bulbs offer a much higher light output, and a longer filament for light distribution.

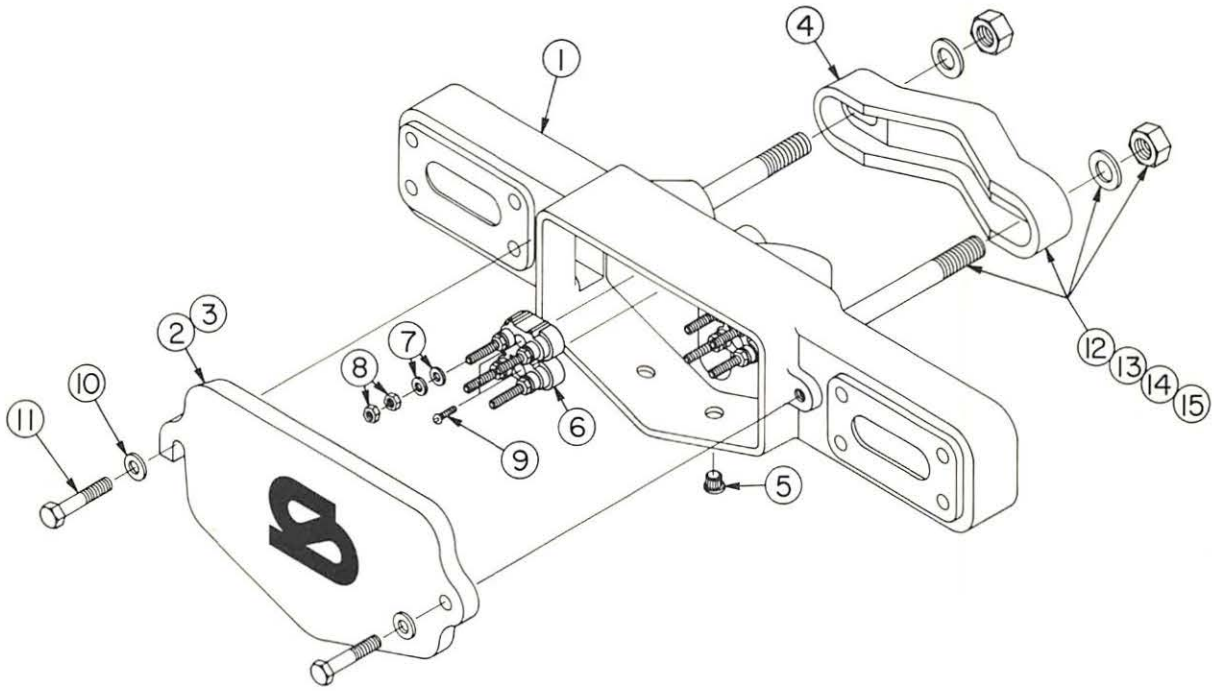
The QI 10-16 (16 watt) is designed as a replacement for 10 volt signal bulbs now used in highway crossing lamps, color light signals, searchlight signals, position light signals, and color position signals.

The QI 10-36 (36 watt) is designed as a replacement for standard signal bulbs in highway crossing signals where a more arrestive indication is required. The filament is longer and oriented axially resulting in an improved vertical spread of the beam when used in a lamp which mounts the bulb vertically.

To Order: Specify Bulb Type and Part Number.

Bulb Type	Volts	Watts	Part Number
QI 10-16	10	16	042349-4X
QI 10-36	10	36	042349-X

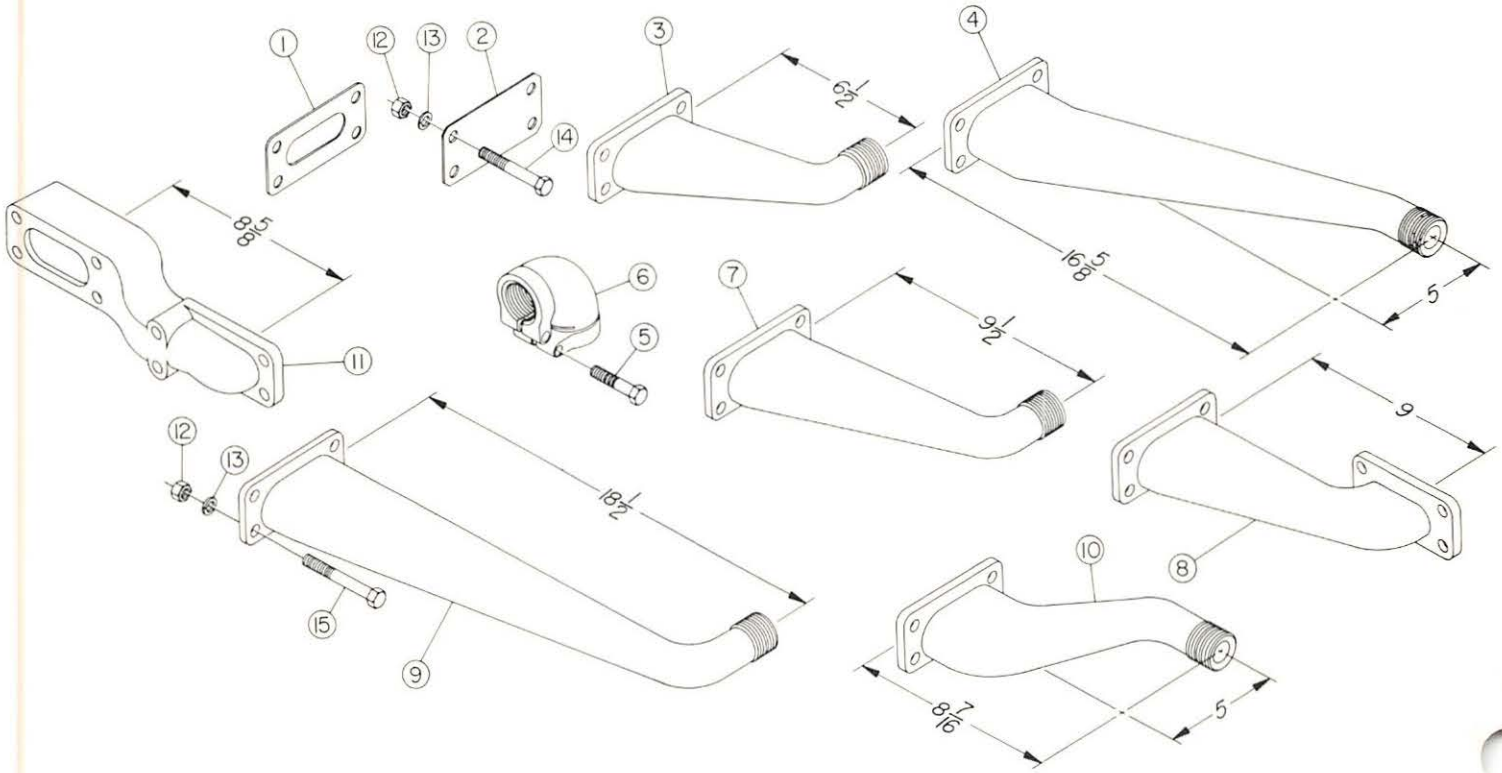
JUNCTION BOX CROSSARM ASSEMBLY REPLACEMENT PARTS



To Order: Specify Description and Part Number.
To order Junction Box Crossarm complete assembly:
Specify for 4" mast #042003-X; 5" mast #042003-5X;
8" mast #042003-6X or 12" mast #042003-11X.

Item Number	Description	Quantity Required	Part Number
1	Crossarm, Junction Box	1	042003-18
2	Cover, Junction Box	1	042006
3	Gasket, Junction Box Cover	1	10-06-002
4	Saddle (included in items 12, 13, 14, and 15)	1	042007
5	Bushing, Vent	2	041913-X
6	Block, Terminal	2	023274-501
7	Washer, Beveled	16	023834
8	Nut, Clamp	16	023832
9	Machine Screw, Round Head, #10-24 x .625"	4	2594-RSC
10	Washer, Wrought, 3/8"	2	1727-SC
11	Cap Screw, Hex Head, 3/8"-16 x 2"	2	4092-HSC
12	Hardware, Mounting, 4"	1	071367-9X
13	Hardware, Mounting, 5"	1	071367-10X
14	Hardware, Mounting, 8"	1	071367-11X
15	Hardware, Mounting, 12"	1	071367-12X

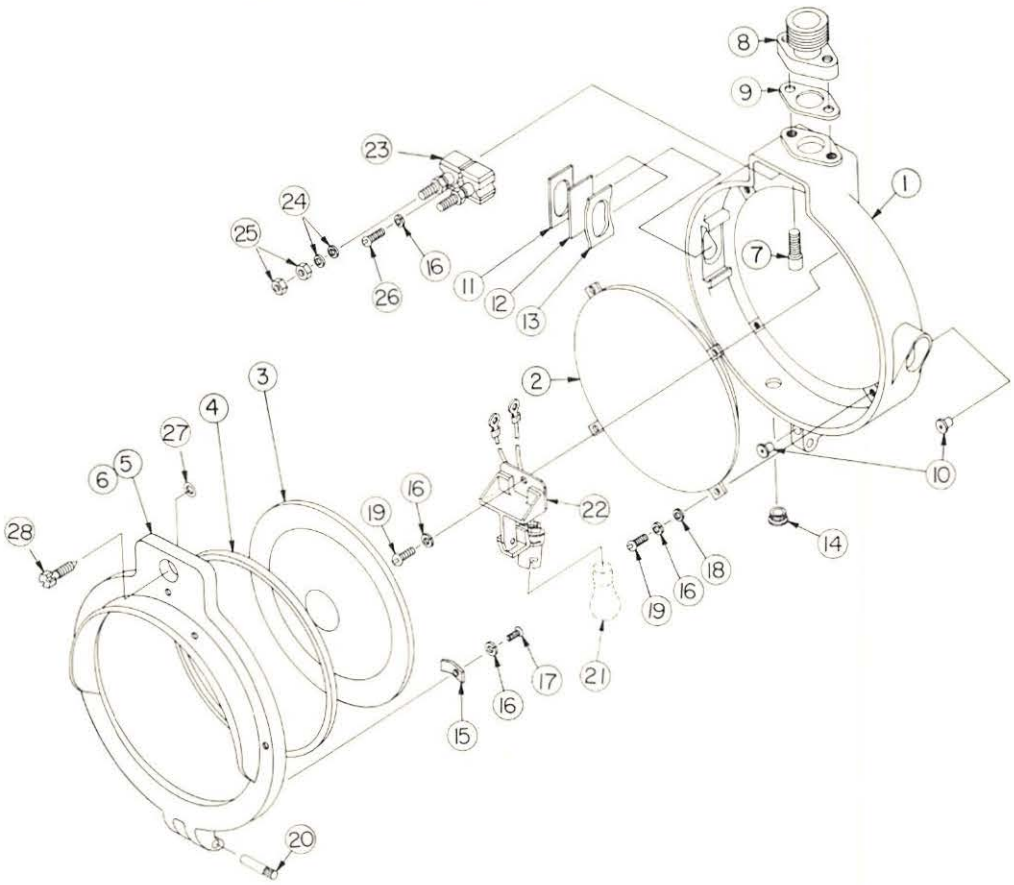
LAMP MOUNTING BRACKETS REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Gasket, Bracket	041291
2	Plate, Crossarm Cover	042041
3	Bracket, Lamp Mounting, 6-1/2" extension	041279-7
4	Bracket, Lamp Mounting, 16-5/8" extension	042027-3
5	Cap Screw, Hex Head, 3/8"-16 x 2"	4092-HSC
6	Elbow, Flashing Lamp Signal, 1-1/4"	041264-1
7	Bracket, Lamp Mounting, 9-1/2" extension	041279-500
8	Bracket, Lamp Mounting, 9" extension	041279-501
9	Bracket, Lamp Mounting, 18-1/2" extension	041279-19
10	Bracket, Lamp Mounting, 8-7/16" extension	042027-4
11	Extension Bracket Junction Box Crossarm	041279-504
12	Nut Hex, 3/8"-16	2104-SC
13	Washer, Spring Lock, M, 3/8"	1810-MSC
14	Cap Screw, Hex Head, 3/8"-16 x 3"	4096-HSC
15	Cap Screw, Hex Head, 3/8"-16 x 3.5"	4098-HSC

FLX-10 FLASHING LAMP REPLACEMENT PARTS

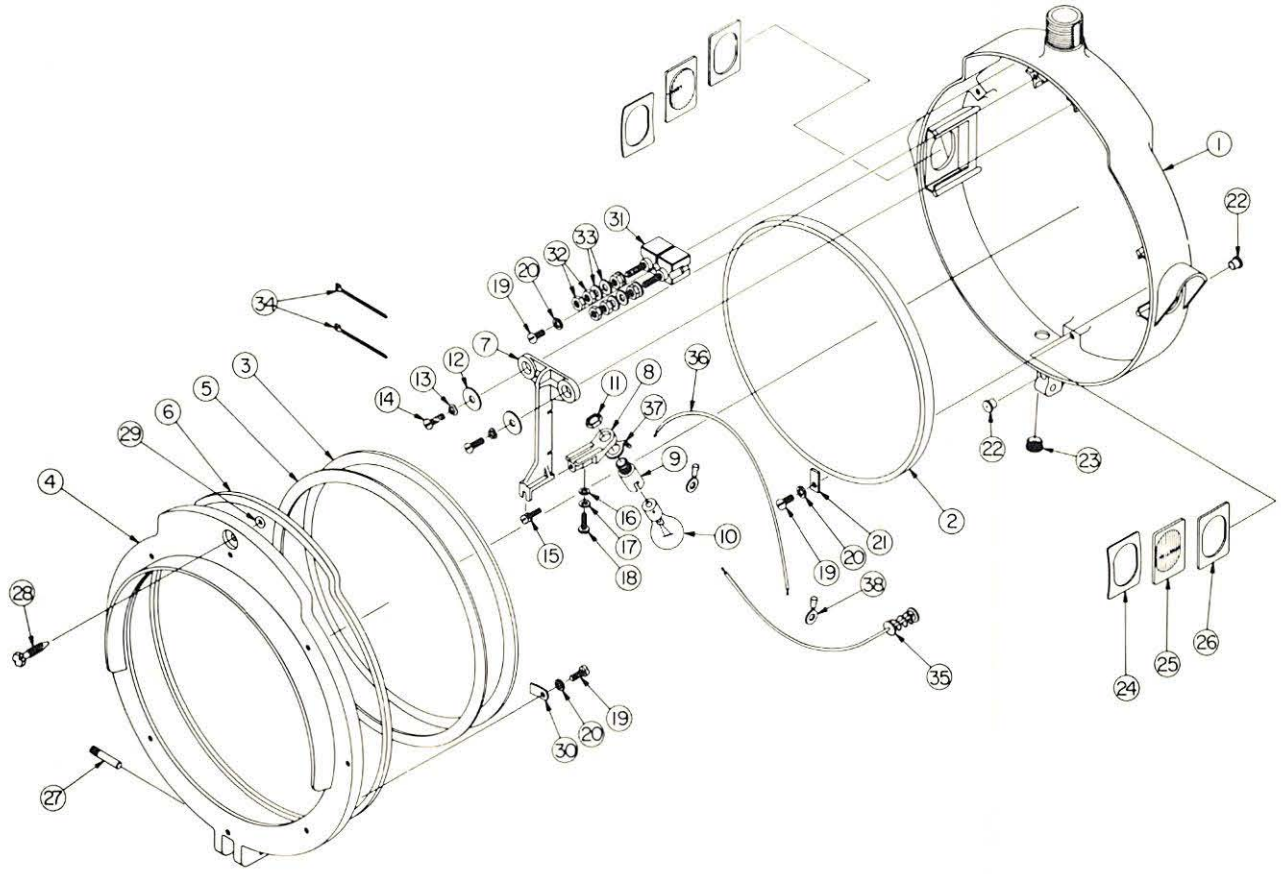


For Complete Assembly, less bulb and roundel, order Part Number 042370-X.
To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number	Item No.	Description	Qty. Req'd	Part Number
1	Housing, FLX-10 Lamp	1	042370	15	Clamp, Roundel	4	042026-3
2	Reflector, FLX-10	1	042376-5	16	Washer, Spring Lock, M, #10	10	1806-ME
3	Roundel (See page A-7-3)	1	Specify	17	Machine Screw, Round Head, #10-24 x .375"	4	2590-RE
4	Gasket, Roundel	1	042031-3				
5	Door, FLX-10	1	042371	18	Washer, Flat, #10	4	1712-RE
6	Gasket, Door	1	10-06-004	19	Machine Screw, Round Head, #10-24 x .5"	5	2592-RE
7	Cap Screw, Socket Head, 3/8"-16 x 1"	2	4088-SSC	20	Pin, Hinge, 5/16"	1	042358-1
8	Connector	1	041214	21	Bulb, Signal (See page A-7-4)	1	Specify
9	Gasket, Connector	1	041220	22	Bracket, Adjust. Bulb Support	1	042372-10X
10	Plug, Alignment	2	042360-3	23	Block, Universal Terminal	1	023390-502X
11	Gasket, Sidelight	2	042377	24	Washer, Beveled	4	023834
12	Lens, Sidelight	2	042357	25	Nut, Clamp	4	023832
13	Retainer, Sidelight	2	042374	26	Machine Screw, #10-24 x .625"	1	2594-RE
14	Bushing Vent	1	041913-X	27	Ring, Retaining	1	042380
				28	Screw, Locking	1	042056

FLX-12 FLASHING LAMP REPLACEMENT PARTS

(DIE CAST VERSION)



For Complete Assembly, less bulb and roundel, order Part Number 042950-X.
To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Housing, FLX-12	1	042951	19	Machine Screw, Fillister Head, 1/4"-20 X .625"	8	2659-LE
2	Reflector, FLX-12	1	042958				
3	Roundel (See page A-7-3)	1	Specify	20	Washer, Spring Lock, M, 1/4"	8	1808-MZ
4	Door, Lamp	1	042952	21	Retainer, Reflector	3	042956
5	Gasket, Roundel	1	042031-4	22	Plug, Alignment	2	042360-3
6	Gasket, Door, .312" X .312"	1	10-06-004	23	Bushing, Vent	1	041913-X
7	Bracket, Bulb Support	1	042953	24	Retainer, Sidelight Cover	2	042374-2
8	Slide, Lamp Holder	1	042954	25	Cover, Sidelight	2	042399-1
9	Socket, Bulb	1	042019-6	26	Gasket, Sidelight Cover	2	042357-4
10	Bulb, Signal (See page A-7-4)	1	Specify	27	Pin, Hinge, 5/16"	1	042358-1
11	Nut, Pal, 7/16"-20	1	2350-SC	28	Screw, Locking	1	042056
12	Spacer, Bulb Support	2	042957	29	Ring, Retaining	1	042380
13	Washer, Shakeproof Lock, 1/4"	2	1981	30	Retainer, Roundel	4	042026-6
14	Machine Screw, Pan Head, 1/4"-20 X .625"	2	2660-PE	31	Block, Terminal	1	023390-502
				32	Nut, Clamp	6	023832
15	Screw, Adjusting	1	042995	33	Washer, Beveled	6	023834
16	Washer, Wrought, #8	1	1709-SC	34	Tie, Plastic Cable	2	18-04-000
17	Washer, Spring, #10	1	1979	35	Wire Assembly, 9-1/2"	1	042021-X
18	Machine Screw, Pan Head, #10-32 X .75"	1	2619-PE	36	Wire, Lead	1	040399-6
				37	Terminal, Ring	1	042356-5
				38	Terminal, Ring	2	024628-110

Safetran

FLASHING LAMP ASSEMBLY

MODELS FLX 1000 L.E.D & FLX 2000 L.E.D.

- **DIRECT REPLACEMENT FOR INCANDESCENT LIGHTING SYSTEM**
- **HIGH VISIBILITY CHARACTERISTICS**
- **BUILT-IN LENS DEFLECTION FOR EACH L.E.D.**
- **REDUCED MAINTENANCE COST**
- **COMPLETE SIGNAL HEAD ASSEMBLIES OR FIELD CONVERSION KITS TO FIT MOST EXISTING FLASHING LIGHT UNITS**
- **LONG LIFE EXPECTANCY**

Safetran's L.E.D. is visually compatible with existing incandescent bulb flashing lamps. Side-by-side cursory examination reveals little difference. Chromaticity (color) is nearly identical to existing incandescent flashing lamps. And, of course, life expectancy is manyfold that of incandescent bulb light sources, and with many small light sources, a single failure does not result in a dark signal.

The unique design of the FLX 1000 & FLX 2000 provides a substantial side light indication to an approaching train that the light is operating. This indication is directly from the flashing lamps and is visible from a considerable distance.

Safetran flashing light units are designed to directly, retro-fit into existing inservice 8" or 12" light housings, or can be purchased as complete flashing lamp assemblies.

The L.E.D. produces mono-chromatic, saturated light. This type of lamp source is reputed to have superior conspicuity characteristics. The Safetran L.E.D. Flashing Lamp also has traditional light beam intensity characteristics.

SPECIFICATIONS

LAMP UNIT FOR RETRO-FIT

Voltage:	8 - 20 Volts AC or DC
Power Consumption:	See Chart Below
Temperature:	-40° F (-40° C) to 160° F (+71° C)
Chromaticity:	Meets AAR Manual Part 7.1.10
Beam Pattern and Values:	Exceeds AAR manual part 3.2.37
Power Surge Rating:	130 VAC for 80 msecs and/or 54 VDC for 80 msecs Exceeds AAR manual part 11.3.3
Construction of Lamp Unit:	High strength polycarbonate
Power Leads:	36" Length

COMPLETE FLASHING LAMP HEAD — Includes L.E.D. lamp unit and aluminum housing as used with incandescent Model FLX-10 or FLX-12

ORDERING INFORMATION

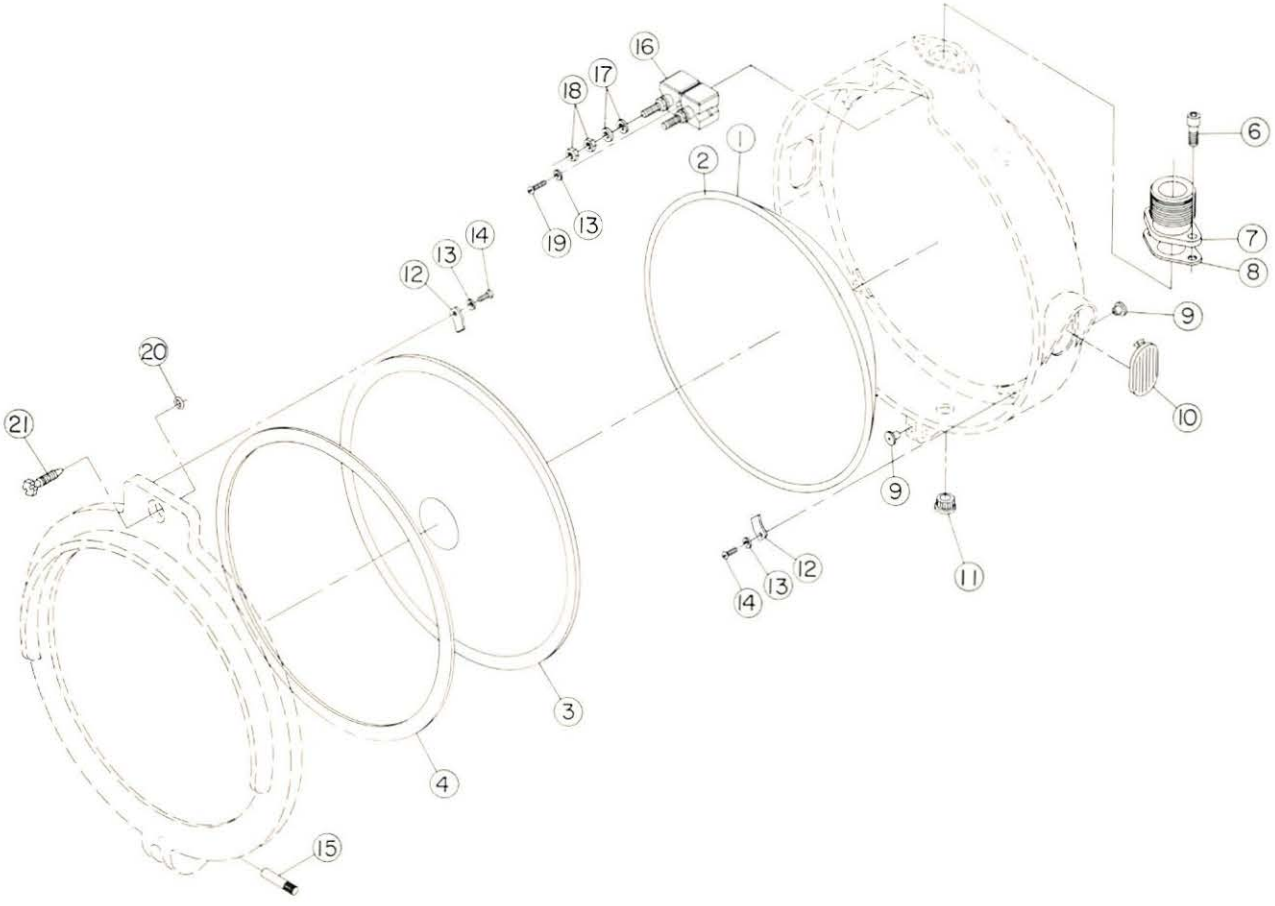
To Order: Specify Description and Part Number

Model	Complete Flashing Light Unit	Retro-Fit Assembly	Watts
FLX1000 (8")	042375-X	042375-1X	11.0
	042375-2X	042375-7X	6.5
FLX 2000 (12")	042975-X	042975-1X	18.0
	042975-3X	042975-2X	12.0

FLX-12 FLASHING LAMP REPLACEMENT PARTS

(SAND CAST VERSION)

Parts shown below are for replacement of sand cast version only. These parts are not interchangable with the new die-cast version as shown on page A-7-8. Complete lamp heads of the sand cast type are no longer available.



To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd	Part Number	Item No.	Description	Qty. Req'd	Part Number
1	Reflector, FLX-12	1	042388	12	Clamp, Roundel	8	042026-3
2	Pad, Reflector	1	042058	13	Washer, Spring Lock, M, #10	11	1806-ME
3	Roundel (See page A-7-3)	1	Specify	14	Machine Screw, Round Head, #10-24 x .5"	10	2592-RE
4	Gasket, Roundel	1	042031-4				
5	Gasket, Door (not shown)	1	10-06-004	15	Pin, Hinge, 5/16"	1	042358-1
6	Cap Screw, Socket Head, 5/16"-18 x 1"	2	4046-SSC	16	Block, Universal Terminal	1	023390-502X
				17	Washer, Beveled	4	023834
7	Connector	1	041214	18	Nut, Clamp	4	023832
8	Gasket, Connector	1	041220	19	Machine Screw, Round Head, #10-24 x .625"	1	2594-RE
9	Plug, Alignment	2	042360-2				
10	Cover, Sidelight	2	042399	20	Ring, Retaining	1	042380
11	Bushing, Vent	1	041913-X	21	Screw, Locking	1	042056

Safetran

HIGHWAY CROSSING BELLS

- **AVAILABLE FOR DC, AC, OR AC/DC OPERATION**
- **ADAPTABLE TO FIT ALMOST ANY SIZE MAST**
- **EASY ONE MAN INSTALLATION**
- **AVAILABLE IN LOUD OR SOFT TONES**

Safetran Highway Crossing Bells are available for 8-12 VDC, 120 VAC, or 12 to 16 VAC/10 to 12 VDC operations.

Approximately 200 strokes per minute are produced with either loud or soft tone clapper.

Bell can be top mounted directly on 4 or 5 inch mast or 6, 8, 10, or 12 inch pipe mast with suitable adapter.

Basic housing is cast aluminum as is the door and rain shield. The 12 inch gong is steel.

The lightweight construction of the bell, approximately 35 pounds, provides for easy one man installation.

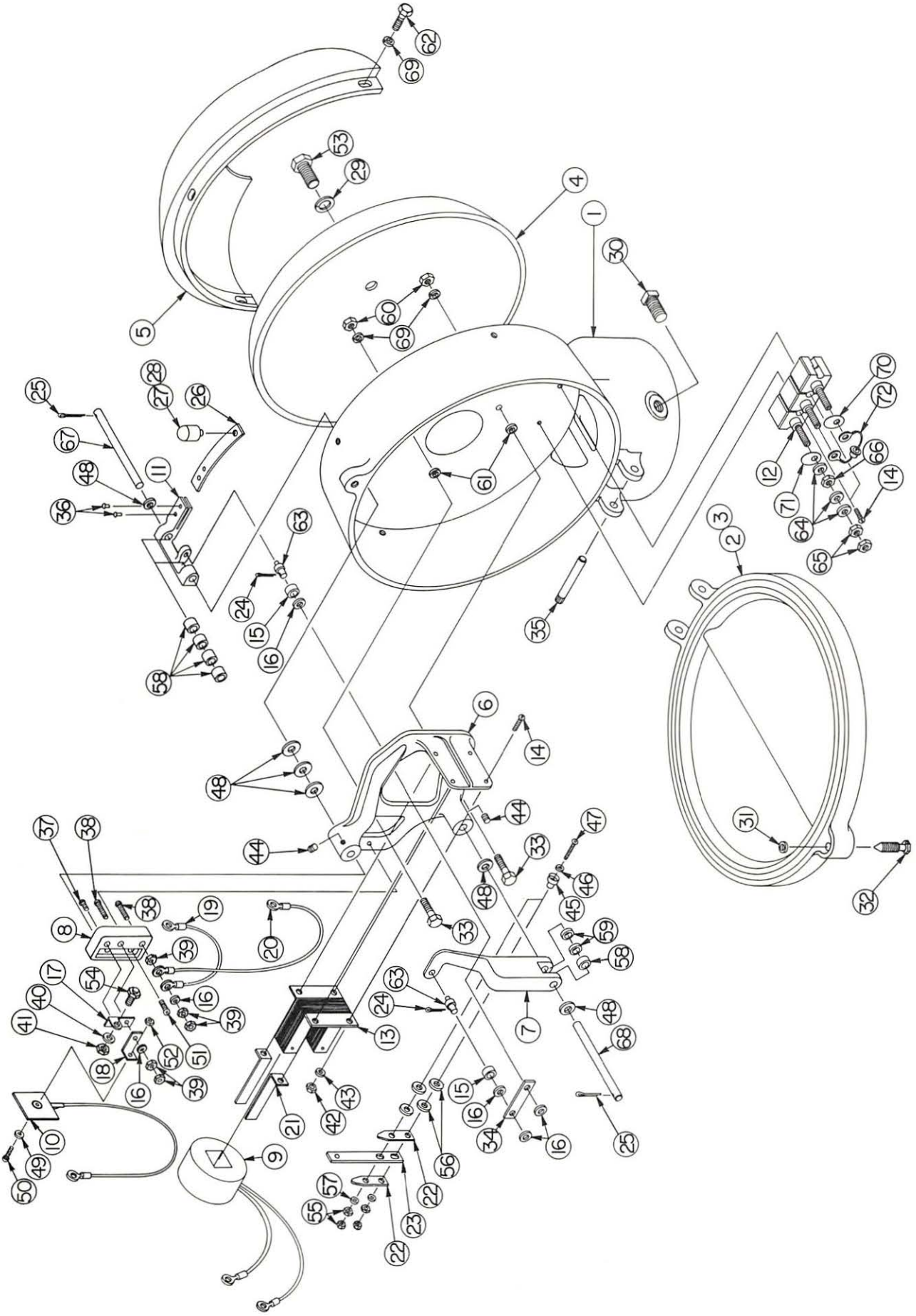
Safetran Highway Crossing Bells meet applicable AAR specifications.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Mast Size	8 - 12 VDC		120 VAC		12 - 16 VAC/10 - 12 VDC	
	Loud Tone	Soft Tone	Loud Tone	Soft Tone	Loud Tone	Soft Tone
4" or 5"	040200-4X	040200-5X	040200-8X	040200-9X	040200-10X	040200-107X

Note: For bells to be mounted on masts other than 4 or 5 inches in size, order desired bell from above table and appropriate adapter from table on page A-8-8.

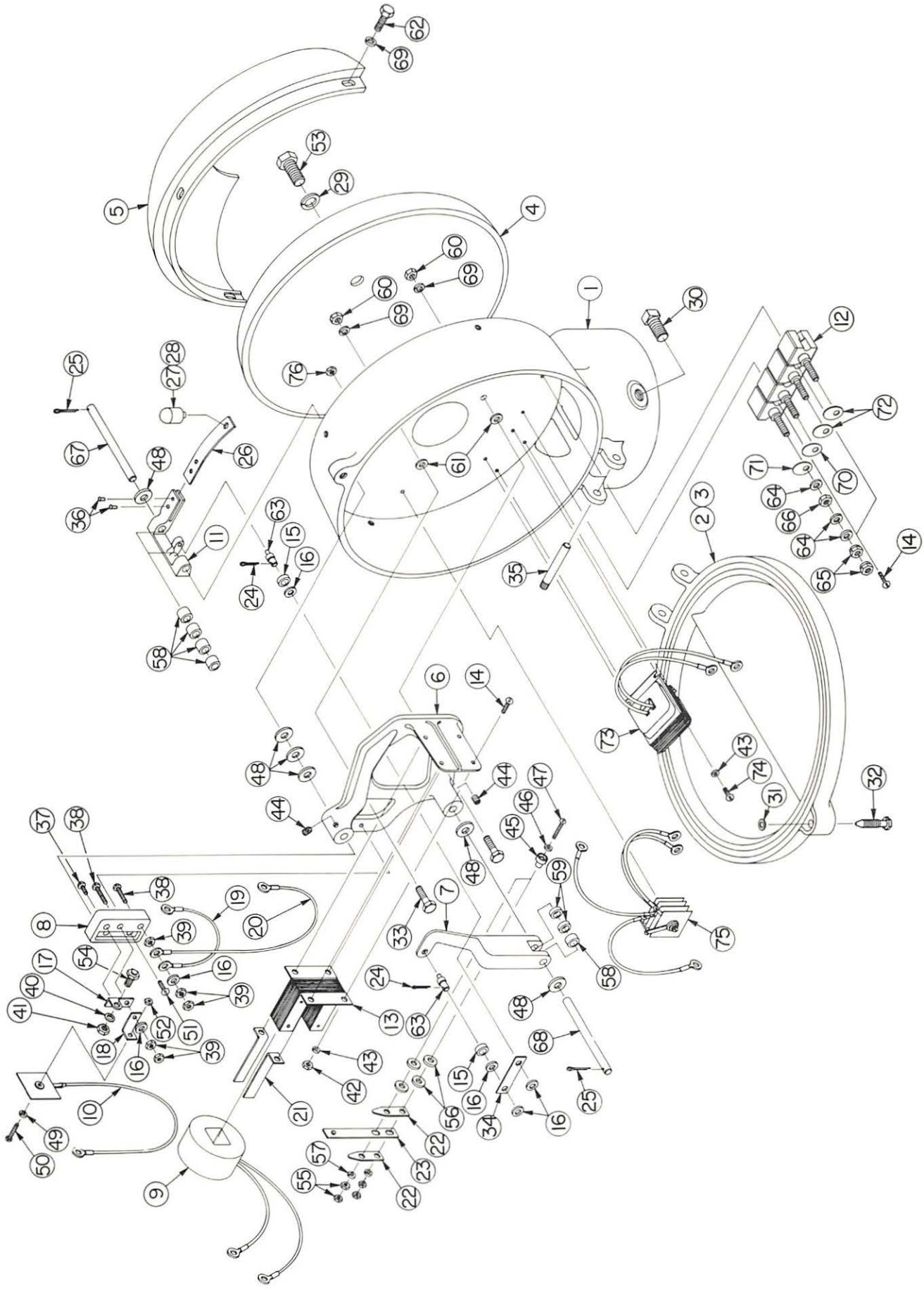


8 - 12 VDC HIGHWAY CROSSING BELL REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Item	Description	Qty. Req'd	Part Number
1	Housing, Bell, DC	1	040221-5
2	Cover, Bell Housing	1	040222-500
3	Gasket, Door	1	10-06-002
4	Gong	1	040224
5	Hood, Bell	1	040223
6	Frame, Clapper	1	040231-500
7	Arm, Magnet Bar	1	040241-500
8	Block, Contact	1	040233
9	Coil, Magnet	1	040252-X
10	Rectifier	1	040244-500X
11	Bracket, Clapper	1	040225-500
12	Block, Terminal	1	023390-509
13	Core, Magnet	1	040249-X
14	Machine Screw, Round Head, #10-24 x .625"	6	2594-RSC
15	Washer, Felt Half	2	040226-1
16	Washer, Cut	6	1710-B
17	Bracket	1	040236
18	Bracket	1	040242
19	Wire, Jumper	1	040292-X
20	Wire, Jumper	1	040291-X
21	Retainer, Coil	2	040253
22	Spring, Backer	2	040243-1
23	Contact, Magnet	1	040243-X
24	Pin, Cotter. 1/16" x .50"	2	1000-SC
25	Pin, Cotter, 3/32" x .75"	2	1008-SC
26	Arm, Clapper	1	040227
27	Clapper, Loud Tone	1	040228
28	Clapper, Soft Tone	1	040260-501X
29	Washer, Spring Lock, M, 1/2"	1	1812-MSC
30	Set Screw, Square Head, 1/2" - 13 x 1"	2	4961-SC
31	Ring, Retaining	1	042380
32	Screw, Hex Locking	1	042056
33	Cap Screw, Hex Head, 1/4" -20 x 1.25"	2	4005-HSC
34	Link	1	040239
35	Pin, Hinge	1	040254
36	Rivet, 1/8" x .375"	2	3503-BB

Item	Description	Qty. Req'd	Part Number
37	Machine Screw, Round Head, #10-32 x .375"	1	2614-RB
38	Machine Screw, Round Head, #10-32 x .875"	2	2620-RB
39	Nut, Hex, #10 - 32	5	2105-B
40	Washer, Shake Proof Lock, I, 1/4"	1	1858-ISN
41	Nut, Hex, 1/4" - 28	1	2019-B
42	Nut, Hex, #10 - 24	4	2104-SC
43	Washer, Spring Lock, M, #10	4	1806-MSC
44	Set Screw, Socket Head, 1/4" -20 x .25"	2	4610-SC
45	Insulator	2	040237
46	Washer, Lock, I	2	1854-ISC
47	Machine Screw, Round Head, #6-32 x .875"	2	2563-RB
48	Washer, Cut	6	1722-C
49	Washer, Cut	1	1708-B
50	Machine Screw, Fillister Head, #8-32 x .625"	1	2576-LB
51	Machine Screw, Round Head, #10-32 x .50"	2	2616-RB
52	Nut, Hex, #8-32	1	2012-B
53	Cap Screw, Hex Head, 1/2" -13 x 1"	1	4166-HSC
54	Screw, Contact	1	040234-X
55	Nut, Hex, #6-32	4	2010-B
56	Washer, Insulator	4	040246
57	Washer, Cut	2	1704-B
58	Washer, Felt	5	040226
59	Washer, Felt Half	2	040226-1
60	Nut, Hex, 1/4" -20	2	2100-SC
61	Pad, Felt	2	040294
62	Cap Screw, Hex Head, 1/4" -20 x .75"	3	4002-HSC
63	Pin, Link	2	040238
64	Washer, Beveled	9	023834
65	Nut, Binding	6	023831
66	Nut, Clamp	3	023832
67	Shaft, Clapper Bracket	1	040230
68	Shaft	1	040232
69	Washer, Spring Lock, M, 1/4"	5	1808-MSC
70	Tag, Vinyl, DC+	1	024359-30
71	Tag, Vinyl, DC-	1	024359-29
72	Diode Assembly	1	019910-500X

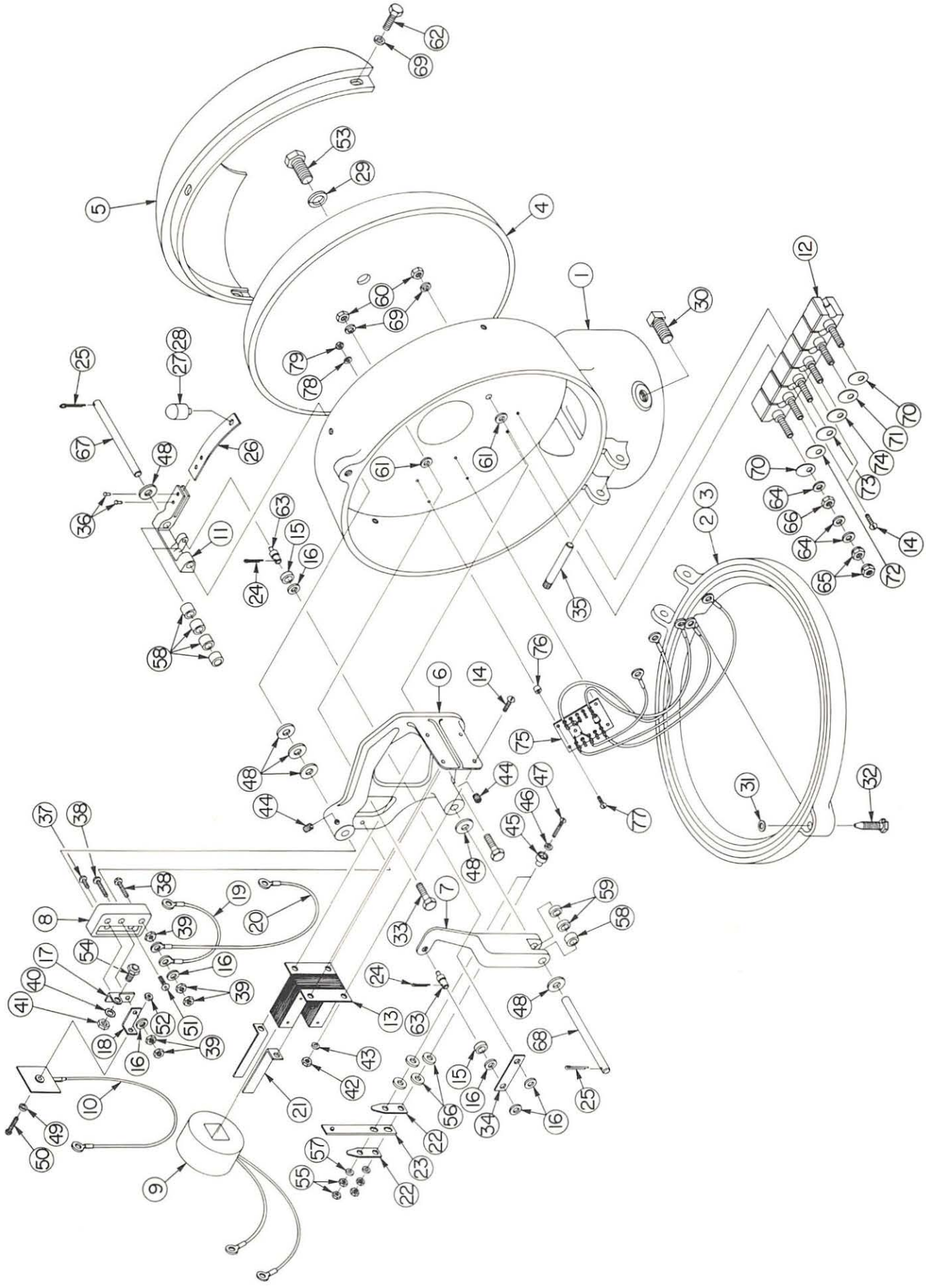


120 VAC HIGHWAY CROSSING BELL
REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Item	Description	Qty. Req'd	Part Number
1	Housing, Bell, AC	1	040221-1
2	Cover, Bell Housing	1	040222-500
3	Gasket, Door	1	10-06-002
4	Gong	1	040224
5	Hood, Bell	1	040223
6	Frame, Clapper	1	040231-500
7	Arm, Magnet Bar	1	040241-500
8	Block, Contact	1	040233
9	Coil, Magnet	1	040252-X
10	Rectifier	1	040244-500X
11	Bracket, Clapper	1	040225-500
12	Block, Terminal	1	023390-503
13	Core, Magnet	1	040249-X
14	Machine Screw, Round Head, #10-24 x .625"	6	2594-RSC
15	Washer, Felt Half	2	040226-1
16	Washer, Cut	6	1710-B
17	Bracket	1	040236
18	Bracket	1	040242
19	Wire, Jumper	1	040292-X
20	Wire, Jumper	1	040291-X
21	Retainer, Coil	2	040253
22	Spring, Backer	2	040243-1
23	Contact, Magnet	1	040243-X
24	Pin, Cotter, 1/16" x .50"	2	1000-SC
25	Pin, Cotter, 3/32" x .75"	2	1008-SC
26	Arm, Clapper	1	040227
27	Clapper, Loud Tone	1	040228
28	Clapper, Soft Tone	1	040260-501X
29	Washer, Spring Lock, M, 1/2"	1	1812-MSC
30	Set Screw, Square Head, 1/2" - 13 x 1"	2	4961-SC
31	Ring, Retaining	1	042380
32	Screw, Hex Locking	1	042056
33	Cap Screw, Hex Head, 1/4" -20 x 1.25"	2	4005-HSC
34	Link	1	040239
35	Pin, Hinge	1	040254
36	Rivet, 1/8" x .375"	2	3503-BB
37	Machine Screw, Round Head, #10-32 x .375"	1	2614-RB
38	Machine Screw, Round Head, #10-32 x .875"	2	2620-RB

Item	Description	Qty Req'd	Part Number
39	Nut, Hex, #10 - 32	5	2105-B
40	Washer, Shake Proof Lock, I, 1/4"	1	1858-ISN
41	Nut, Hex, 1/4" - 28	1	2019-B
42	Nut, Hex, #10 - 24	4	2104-SC
43	Washer, Spring Lock, M, #10	8	1806-MSC
44	Set Screw, Socket Head, 1/4" -20 x .25"	2	4610-SC
45	Insulator	2	040237
46	Washer, Lock, I	2	1854-ISC
47	Machine Screw, Round Head, #6-32 x .875"	2	2563-RB
48	Washer, Cut	6	1722-C
49	Washer, Cut	1	1708-B
50	Machine Screw, Fillister Head, #8-32 x .625"	1	2576-LB
51	Machine Screw, Round Head, #10-32 x .50"	2	2616-RB
52	Nut, Hex, #8-32	1	2012-B
53	Cap Screw, Hex Head, 1/2" -13 x 1"	1	4166-HSC
54	Screw, Contact	1	040234-X
55	Nut, Hex, #6-32	4	2010-B
56	Washer, Insulator	4	040246
57	Washer, Cut	2	1704-B
58	Washer, Felt	5	040226
59	Washer, Felt Half	2	040226-1
60	Nut, Hex, 1/4" -20	2	2100-SC
61	Pad, Felt	2	040294
62	Cap Screw, Hex Head, 1/4" -20 x .75"	3	4002-HSC
63	Pin, Link	2	040238
64	Washer, Beveled	12	023834
65	Nut, Binding	8	023831
66	Nut, Clamp	4	023832
67	Shaft, Clapper Bracket	1	040230
68	Shaft	1	040232
69	Washer, Spring Lock, M, 1/4"	5	1808-MSC
70	Tag, Vinyl, DC+	1	024359-30
71	Tag, Vinyl, DC-	1	024359-29
72	Tag, Vinyl, AC	2	024359-25
73	Transformer, 24V, 20W	1	040259-500X
74	Machine Screw, Round Head, #10-24 x .375"	4	2590-RSC
75	Rectifier	1	040258-500X
76	Nut, Hex, #8-32	1	2012-SC



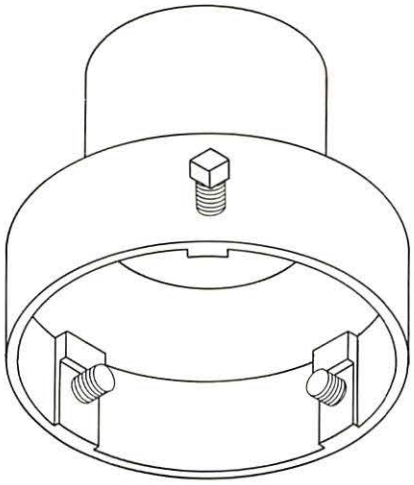
12 - 16 VAC/10 - 12 VDC HIGHWAY CROSSING BELL
REPLACEMENT PARTS

Item	Description	Qty. Req'd	Part Number
1	Housing, Bell, AC - DC	1	040221-2
2	Cover, Bell Housing	1	040222-500
3	Gasket, Door	1	10-06-002
4	Gong	1	040224
5	Hood, Bell	1	040223
6	Frame, Clapper	1	040231-500
7	Arm, Magnet Bar	1	040241-500
8	Block, Contact	1	040233
9	Coil, Magnet	1	040252-X
10	Rectifier	1	040244-500X
11	Bracket, Clapper	1	040225-500
12	Block, Terminal	1	023390-504
13	Core, Magnet	1	040249-X
14	Machine Screw, Round Head, #10-24 x .625"	6	2594-RSC
15	Washer, Felt Half	2	040226-1
16	Washer, Cut	6	1710-B
17	Bracket	1	040236
18	Bracket	1	040242
19	Wire, Jumper	1	040292-X
20	Wire, Jumper	1	040291-X
21	Retainer, Coil	2	040253
22	Spring, Backer	2	040243-1
23	Contact, Magnet	1	040243-X
24	Pin, Cotter, 1/16" x .50"	2	1000-SC
25	Pin, Cotter, 3/32" x .75"	2	1008-SC
26	Arm, Clapper	1	040227
27	Clapper, Loud Tone	1	040228
28	Clapper, Soft Tone	1	040260-501X
29	Washer, Spring Lock, M, 1/2"	1	1812-MSC
30	Set Screw, Square Head, 1/2" - 13 x 1"	2	4961-SC
31	Ring, Retaining	1	042380
32	Screw, Hex Locking	1	042056
33	Cap Screw, Hex Head, 1/4" -20 x 1.25"	2	4005-HSC
34	Link	1	040239
35	Pin, Hinge	1	040254
36	Rivet, 1/8" x .375"	2	3503-BB
37	Machine Screw, Round Head, #10-32 x .375"	1	2614-RB
38	Machine Screw, Round Head, #10-32 x .875"	2	2620-RB
39	Nut, Hex, #10 - 32	5	2105-B
40	Washer, Shake Proof Lock, I, 1/4"	1	1858-ISN

Item	Description	Qty. Req'd	Part Number
41	Nut, Hex, 1/4" - 28	1	2019-B
42	Nut, Hex, #10 - 24	4	2104-SC
43	Washer, Spring Lock, M, #10	4	1806-MSC
44	Set Screw, Socket Head, 1/4" -20 x .25"	2	4610-SC
45	Insulator	2	040237
46	Washer, Lock, I	2	1854-ISC
47	Machine Screw, Round Head, #6-32 x .875"	2	2563-RB
48	Washer, Cut	6	1722-C
49	Washer, Cut	1	1708-B
50	Machine Screw, Fillister Head, #8-32 x .625"	1	2576-LB
51	Machine Screw, Round Head, #10-32 x .50"	2	2616-RB
52	Nut, Hex, #8-32	1	2012-B
53	Cap Screw, Hex Head, 1/2" -13 x 1"	1	4166-HSC
54	Screw, Contact	1	040234-X
55	Nut, Hex, #6-32	4	2010-B
56	Washer, Insulator	4	040246
57	Washer, Cut	2	1704-B
58	Washer, Felt	5	040226
59	Washer, Felt Half	2	040226-1
60	Nut, Hex, 1/4" -20	2	2100-SC
61	Pad, Felt	2	040294
62	Cap Screw, Hex Head, 1/4" -20 x .75"	3	4002-HSC
63	Pin, Link	2	040238
64	Washer, Beveled	18	023834
65	Nut, Binding	12	023831
66	Nut, Clamp	6	023832
67	Shaft, Clapper Bracket	1	040230
68	Shaft	1	040232
69	Washer, Spring Lock, M, 1/4"	5	1808-MSC
70	Tag, Vinyl, DC+	1	024359-30
71	Tag, Vinyl, DC-	1	024359-29
72	Tag, Vinyl, AC	2	024359-25
73	Tag, Vinyl, 1	1	024359-31
74	Tag, Vinyl, 2	1	024359-32
75	Board, Rectifier	1	012211-500X
76	Spacer, Fiber	4	010606-2
77	Machine Screw, Pan Head, #6-32 x .50"	4	2559-PSC
78	Washer, Spring Lock, M, #6	4	1804-MSC
79	Nut, Hex, #6-32	4	2010-B

To Order: Specify Description and Part Number.

BELL ADAPTERS



To Order: Specify Bell Adapter, Mast Size and Part Number.

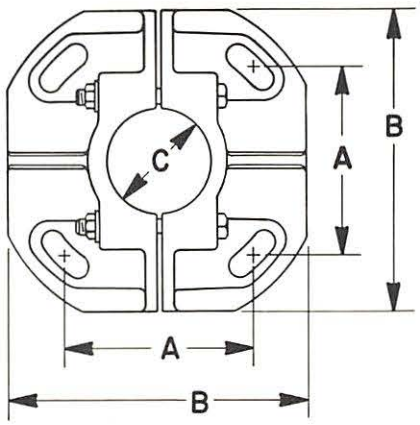
Mast Size in inches	Part Number
6"	040293-X
8"	035048-500X
10"	035063-X
12"	035062-X

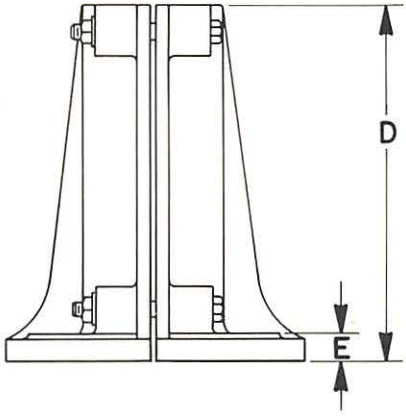
Note: Safetran's Highway Crossing Bells are designed to fit directly on both 4 and 5 inch masts.

Safetran

BASES

SPLIT BASES FOR HEAVY LOADING





- **DESIGNED ESPECIALLY FOR HEAVY LOADING**
- **SLOTTED HOLES FOR EASIER INSTALLATION**

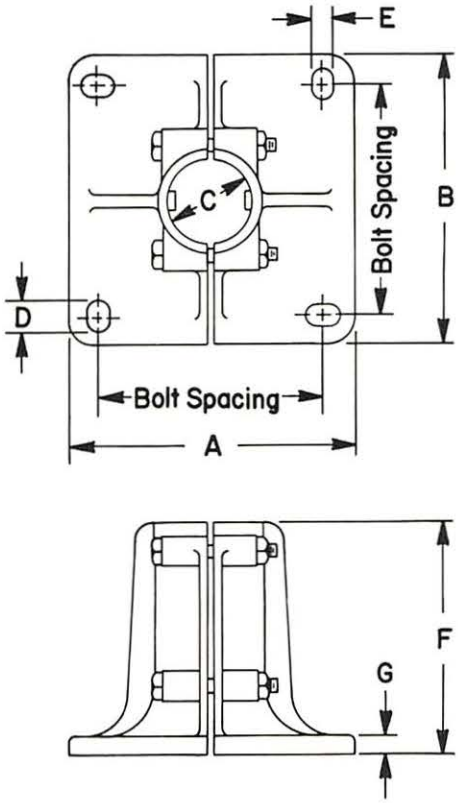
Safetran's 5 inch Split Base is constructed of aluminum or cast iron painted with red oxide primer. The 6 and 8 inch Split Bases are cast aluminum. All 3 bases are designed for 11-11/16 x 11-11/16 inch bolt spacing.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number	Dimensions in Inches				
		A	B	C	D	E
Cast Iron Construction						
5" Split Base	041907-X	11-11/16	17	5-9/16	17	1-5/8
Cast Aluminum Construction						
5" Split Base	041933-X	11-11/16	17	5-9/16	17	1-5/8
6" Split Base	041925-AX	11-11/16	18-1/2	6-5/8	22	1-3/8
8" Split Base	041918-X	11-11/16	17	8-5/8	17	1-5/8

SPLIT BASES FOR LIGHT LOADING



- **DESIGNED ESPECIALLY FOR LIGHT LOADING**
- **SLOTTED HOLES FOR EASIER INSTALLATION**
- **CAST ALUMINUM OR CAST IRON CONSTRUCTION**

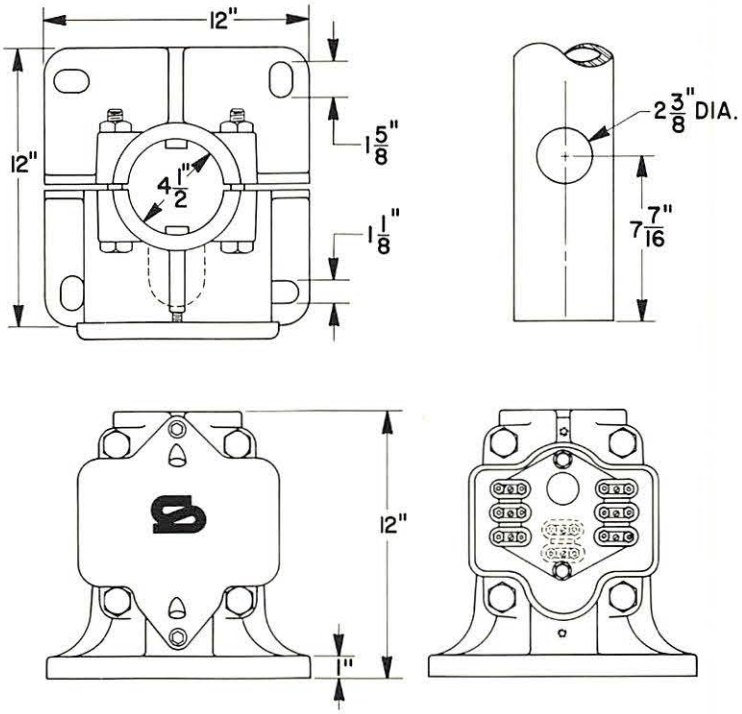
Safetran Split Bases for light loading are available for 2, 3, 4, and 5 inch pipe sizes. Bases constructed of cast iron are painted with red oxide primer. Bases are available in cast iron or aluminum as indicated in table below.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number	Dimensions in Inches							
		Bolt Spacing	A	B	C	D	E	F	G
Cast Aluminum Construction									
4" Split Base	041905-AX	9-1/2 x 9-1/2	12	12	4-1/2	1-5/8	1-1/8	12	1
4" Split Base	041901-AX	11-11/16 x 11-11/16	14-3/4	14-3/4	4-1/2	1-5/8	1-1/8	12	1
Cast Iron Construction									
2" Split Base	150332-X	8 x 6	10	8-1/4	2-3/4	1-1/4	1	7	13/16
3" Split Base	150331-X	8 x 6	10-1/4	8-1/4	3-1/2	1-3/16	13/16	7-1/8	3/4
4" Split Base	041905-X	9-1/2 x 9-1/2	12	12	4-1/2	1-5/8	1-1/8	12	1
4" Split Base	041901-X	11-11/16 x 11-11/16	14-3/4	14-3/4	4-1/2	1-5/8	1-1/8	12	1
5" Split Base	041916-X	11-11/16 x 11-11/16	14-3/4	14-3/4	5-9/16	1-5/8	1-1/8	12	1-1/4

SINGLE AND DOUBLE JUNCTION BOX BASES FOR 4 INCH PIPE APPLICATIONS



Bases can be furnished in cast iron or cast aluminum. Cast iron bases are painted with red oxide primer.

Reversible insert adapts base from mast drilled according to AAR standard of 7-7/16 inches, to mast drilled 5 inches from bottom of pipe.

Single Junction Box Bases can be furnished with either 6 or 8 Duplex Terminal Posts.

Double Junction Box Bases can be furnished with either 12 or 16 Duplex Terminal Posts.

Both the single and double junction box bases can be furnished for either 9-1/2 x 9-1/2 inch or 11-11/16 x 11-11/16 inch bolt spacing.

SINGLE AND DOUBLE JUNCTION BOX BASES FOR 4 INCH PIPE

ORDERING INFORMATION

FOR 9-1/2 x 9-1/2 INCH BOLT SPACING

To Order: Specify Base Type and Part Number.

Base Type	Number of Duplex Terminal Posts	Part Number	
		W/Terminals	W/O Terminals
Cast Iron Construction			
Single Junction Box	6	041906-X	041906-500X
Single Junction Box	8	041906-1X	041906-500X
Double Junction Box	12	041906-2X	041906-501X
Double Junction Box	16	041906-3X	041906-501X
Cast Aluminum Construction			
Single Junction Box	6	041906-AX	041906-502X
Single Junction Box	8	041906-1AX	041906-502X
Double Junction Box	12	041906-2AX	041906-503X
Double Junction Box	16	041906-3AX	041906-503X

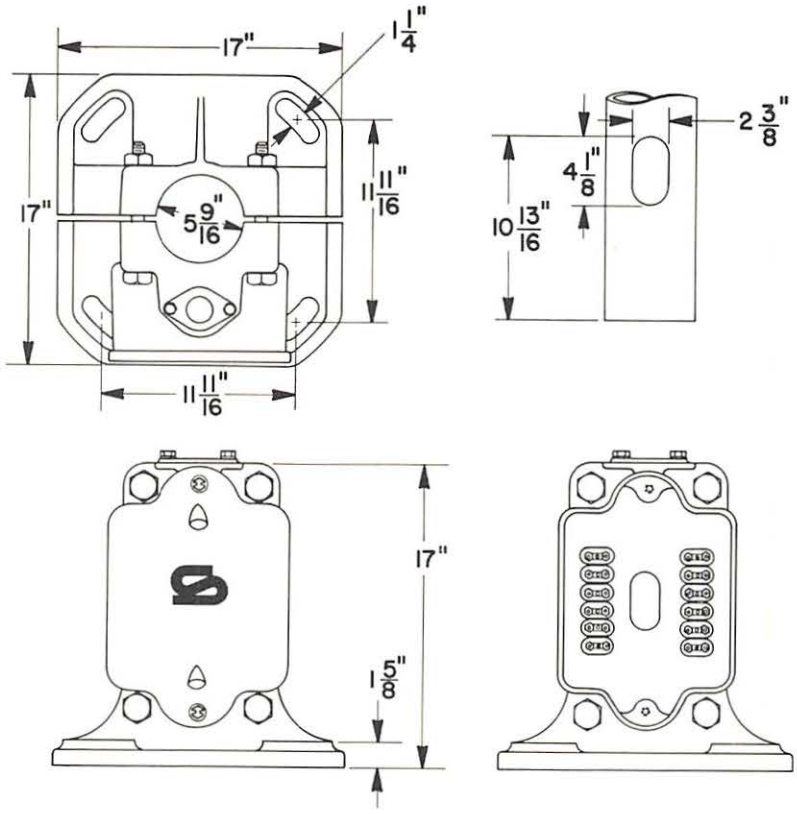
FOR 11-11/16 x 11-11/16 INCH BOLT SPACING

To Order: Specify Base Type and Part Number.

Base Type	Number of Duplex Terminal Posts	Part Number	
		W/Terminals	W/O Terminals
Cast Iron Construction			
Single Junction Box	6	041902-X	041902-500X
Single Junction Box	8	041902-1X	041902-500X
Double Junction Box	12	041902-2X	041902-501X
Double Junction Box	16	041902-3X	041902-501X
Cast Aluminum Construction			
Single Junction Box	6	041902-AX	041902-502X
Single Junction Box	8	041902-1AX	041902-502X
Double Junction Box	12	041902-2AX	041902-503X
Double Junction Box	16	041902-3AX	041902-503X

A multi-terminal block assembly containing 6 Duplex Terminals (12 terminal posts), 24 binding nuts, 12 clamp nuts, 36 beveled washers, and 6 terminal connectors can be ordered by specifying multi-terminal block assembly and order number 023274-21X.

SINGLE AND DOUBLE JUNCTION BOX BASES FOR 5 INCH PIPE APPLICATIONS



Bases are available in both cast iron and cast aluminum construction. Cast iron bases are painted with red oxide primer. There is a 2 - 11 x 1.5 inch NPT plug on each side of the junction box. These plugs will not be furnished unless specified. The single junction box base is furnished with 12 duplex terminal posts; whereas the double junction box base is furnished with 24.

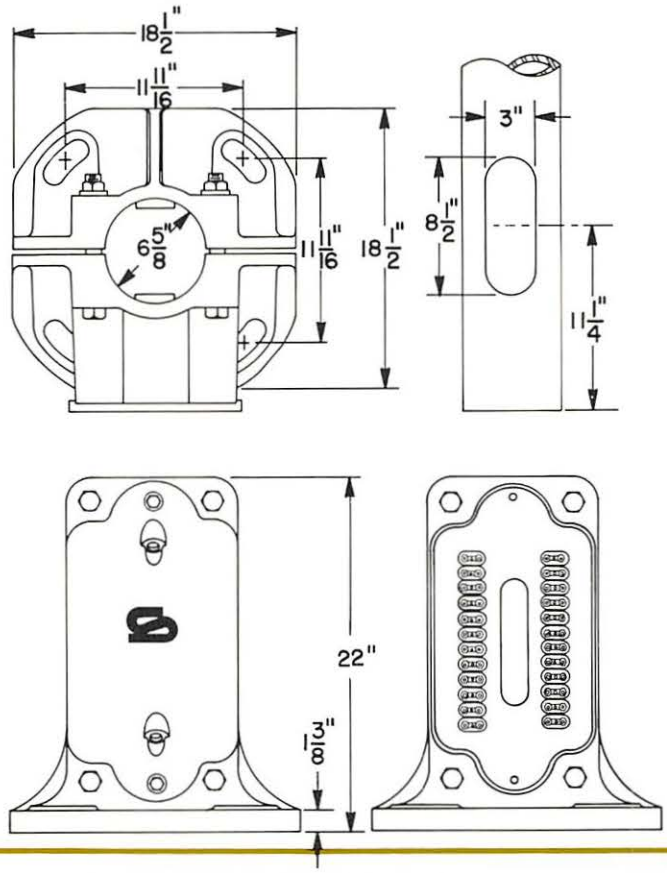
ORDERING INFORMATION

To Order: Specify Base Type and Part Number.

Base Type	Part Number			
	Cast Iron		Cast Aluminum	
	W/Terminals	W/O Terminals	W/Terminals	W/O Terminals
5" Single Junction Box	041908-X	041908-500X	041931-2X	041931-4X
5" Double Junction Box	041908-1X	041908-501X	041931-1X	041931-500X

A multi-terminal block assembly containing 6 Duplex Terminals (12 terminal posts), 24 binding nuts, 12 clamp nuts, 36 beveled washers, and 6 terminal connectors can be ordered by specifying multi-terminal block assembly and order number 023274-21X.

SINGLE AND DOUBLE JUNCTION BOX BASES FOR 6 INCH PIPE APPLICATIONS



Single and Double Junction Box Bases for 6 inch pipe application are constructed of cast aluminum and are designed for 11-11/16 x 11-11/16 inch bolt spacing. The single junction box base can be furnished with up to 24 double terminal posts; whereas the double junction box base can be furnished with up to 48. Specify number of terminal posts desired when ordering.

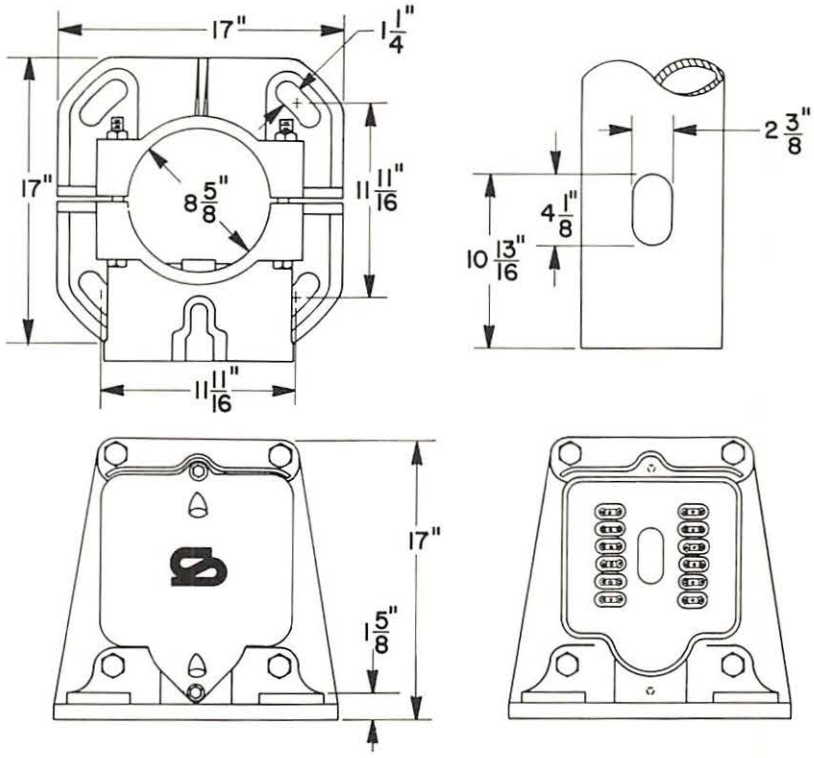
ORDERING INFORMATION

To Order: Specify Base Type and Part Number.

Base Type	Part Number	
	W/Terminals	W/O Terminals
6" Single Junction Box	041926-1X	041926-500X
6" Double Junction Box	041926-1AX	041926-501X

A multi-terminal block assembly containing 6 Duplex Terminals (12 terminal posts), 24 binding nuts, 12 clamp nuts, 36 beveled washers, and 6 terminal connectors can be ordered by specifying multi-terminal block assembly and order number 023274-21X.

SINGLE AND DOUBLE JUNCTION BOX BASES FOR 8 INCH PIPE APPLICATIONS



Single and Double Junction Box Bases for 8 inch pipe application are constructed of cast aluminum and are designed for 11-11/16 x 11-11/16 inch bolt spacing. The single junction box base is furnished with 12 duplex terminal posts; whereas the double junction box base is furnished with 12 duplex terminal posts in each half.

ORDERING INFORMATION

To Order: Specify Base Type and Part Number.

Base Type	Part Number	
	W/Terminals	W/O Terminals
8" Single Junction Box	041919-X	041919-1X
8" Double Junction Box	041919-2X	041919-500X

A multi-terminal block assembly containing 6 Duplex Terminals (12 terminal posts), 24 binding nuts, 12 clamp nuts, 36 beveled washers, and 6 terminal connectors can be ordered by specifying multi-terminal block assembly and order number 023274-21X.

Safetran

STANDARD PASSIVE ADVANCE WARNING SIGN ASSEMBLIES

- MEETS APPLICABLE AAR SPECIFICATIONS
- CORROSION RESISTANT
- WIDE ANGLE REFLECTING PROPERTIES
- LIGHT WEIGHT, EASY TO ERECT

The "RR" Passive Advance Warning Sign, Uniform Traffic code type, is 36 inches in diameter. Made of aluminum, the sign is lightweight, easy to erect and maintain, and is corrosion resistant. The reflex reflecting material, attached permanently to the sign face, has wide angle reflecting qualities that make the sign visible in day or night. The Advance Warning Sign is black image on yellow background.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
36" Advance Warning Sign	085275
Sign mounted on 2-lb. x 11 ft. steel channel post	085275-Y
Sign with hardware for 2-lb. Channel Post Mounting	085275-YX
Sign with hardware for 4" x 4" Wood Post Mounting	085275-1Y
Sign mounted on 4" dia. x 12' - 11" aluminum pipe and split base with 9-1/2" x 9-1/2" bolt spacing.	085275-2X
Sign with hardware for 4" pipe mounting	085275-2Y
Sign with Adjustable Stainless Steel Mounting Straps	085275-3Y

Safetran

NO LEFT TURN, NO RIGHT TURN, AND MARKER LAMP MAST ASSEMBLIES

- **ALL ALUMINUM CONSTRUCTION***
- **LARGE SELECTION OF LEGENDS AVAILABLE**
- **MEETS ALL APPLICABLE AAR SPECIFICATIONS**

Safetran No Left Turn, No Right Turn (illuminated legend), signal and marker lamp assemblies are furnished with 4 inch aluminum mast and base. The bases can be either the junction box or split base type. The illuminated lamp door and body are cast aluminum. The marker lamp is the aluminum FLX-10 flashing lamp unit with yellow lens, or as specified.

ORDERING INFORMATION

Order Number for Standard Assembly 071850-AX, Specify Legend

To Order: Specify the following:

1. No Left Turn, No Right Turn and Marker Lamp mast assembly.
2. Front, side, or two side of mast mounted legend lamps.
3. Front or side mast mounted marker lamp.
4. Base - either split or junction box type and bolt spacing (See Section A-9).
5. Legend or legends desired (See Page A-11-2).
6. A yellow plastic diffusing lens will be furnished in marker lamp unless otherwise specified (See Section A-7).

*Available in steel upon request.

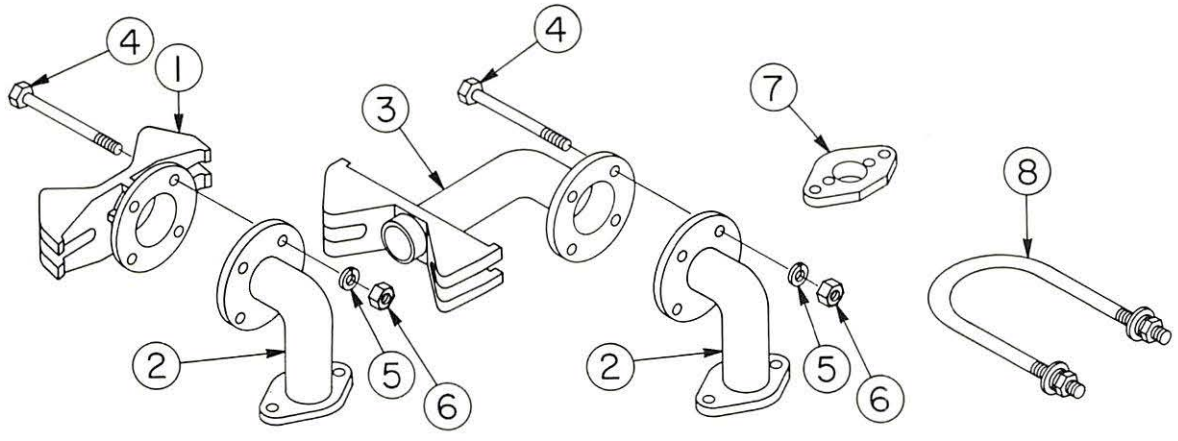
LEGEND ROUNDELS

All legend roundels are 14 inches in diameter. Roundels not listed in table below can be ordered by specifying legend required.

To Order: Specify Legend and Part Number.

Legend	Part Number	Legend	Part Number
No Right Turn	071805-X	H	071835-X
No Left Turn	071806-X	E	071829-X
Clear Track	071839-X	O	071841-X
Don't Walk	071834-X	P	071831-X
Hot Box	071827-X	S	071828-X
Stop	071833-X	W	071838-X
Train	071832-X	X	071830-X
T O	072836-X	Z	071837-X
D E	070840-X		

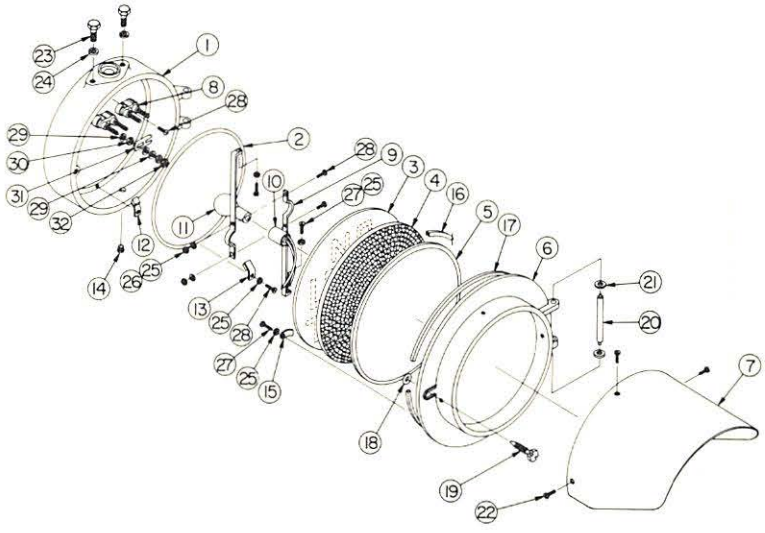
BRACKETS AND HARDWARE REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Clamp, Adapter, Front of Mast	071802
2	Bracket, Lamp Mounting	071803
3	Clamp, Adapter, Side of Mast	071804
4	Cap Screw, Hex Head, 1/2"-13 x 3"	4174-HSC
5	Washer, Spring Lock, M, 1/2"	1812-MSC
6	Nut, Hex, 1/2"-13	2108-SC
7	Plate, Adapter	041428-1A
8	U Bolt, 4"	035004-2X

NO TURN SIGNAL LAMP HEAD REPLACEMENT PARTS



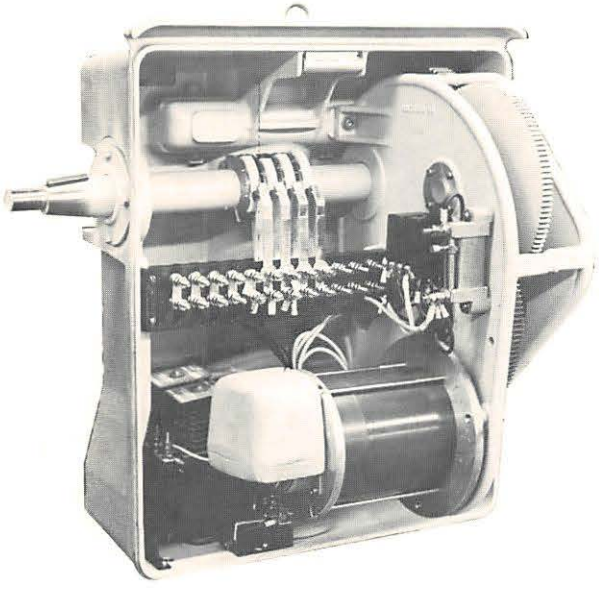
To Order: Specify Description and Part Number.
For complete lamp head assembly, order No. 071800-99X and specify legend (see A-11-2).

Item Number	Description	Quantity Required	Part Number
1	Housing, No Turn Lamp	1	071809-10
2	Reflector	1	071817-1
3	Roundel, Legend (see page A-11-2)	1	Specify
4	Phankill	1	071826-10
5	Cover, Roundel	1	071807-P
6	Door, No Turn Lamp	1	071812-10
7	Hood, No Turn Lamp	1	071814-10
8	Terminal	2	023274-24X
9	Clamp, Socket	2	071818-10
10	Socket, Lamp	1	042019-1X
11	Bulb (see page A-7-4)	1	Specify
12	Clamp, Reflector, Back	3	071821-10X
13	Clamp, Reflector, Front	3	071821-11X
14	Bushing, Vent	1	041913-X
15	Clamp, Lens	3	042026
16	Gasket, Lens	1	071808-14
17	Gasket, Door	1	104513
18	O-Ring	1	042380
19	Bolt, Locking	1	042056
20	Pin, Hinge	1	051537-2
21	Washer, Flat, 1/4"	2	1717-SC
22	Machine Screw, Truss Head, #10-24 x .3125"	3	2589-TSC
23	Cap Screw, Hex Head, 1/2"-13 x 1.5"	2	4168-HSC
24	Washer, Spring Lock, M, 1/2"	2	1812-MSC
25	Washer, Spring Lock, M, #10	12	1806-MSC
26	Nut, Hex, #10-24	2	2014-SC
27	Machine Screw, Round Head, #10-24 x .5"	5	2592-RSC
28	Machine Screw, Round Head, #10-24 x .625"	7	2594-RSC
29	Washer, Beveled	12	023834
30	Nut, Clamp	4	023832
31	Connector, Terminal	2	023837
32	Nut, Binding	8	023831

Safetran

INDUSTRIAL GATE

MODEL SMB



- **115 VAC OR 12 VDC OPERATION**
- **RAILROAD SIGNAL QUALITY IN AN INDUSTRIAL GATE**
- **WEATHERPROOF LIGHTWEIGHT CAST ALUMINUM HOUSING**
- **EQUIPPED WITH SEALED, FACTORY LUBRICATED BEARINGS**

The Model SMB Gate is similar to the Model S Gate, and uses the same gear train, housing, and mounting as well as arms and counterweights.

It is equipped with permanent magnet 12 VDC Motor and a disc brake hold clear assembly. The hold clear is energized when the gate is vertical and is de-energized to drop the gate.

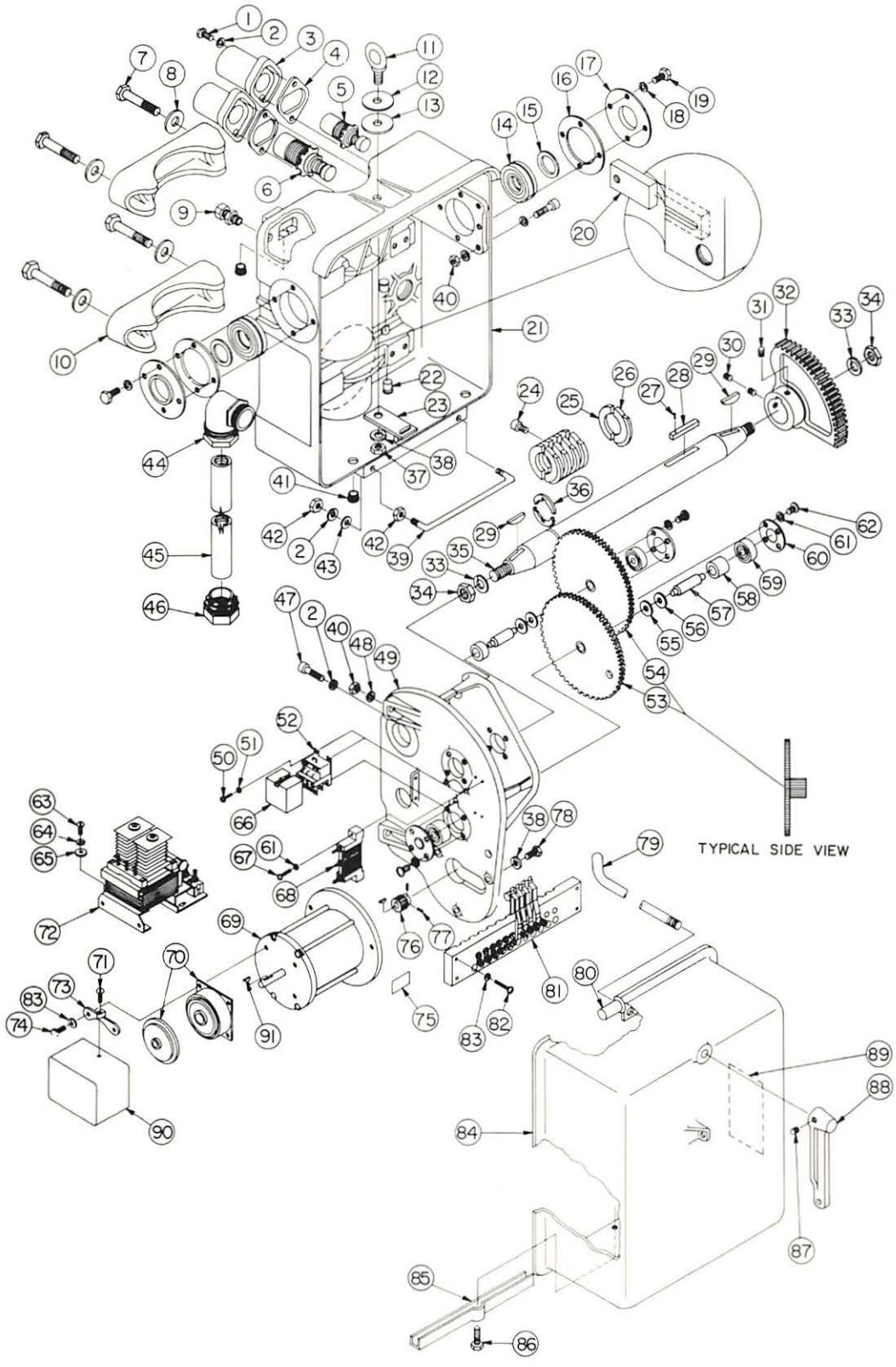
Operating voltage is normally 115 VAC with a 115/12 V supply mounted in the gate mechanism cabinet. If 12 VDC operation is desired the power supply is omitted. Gate operation can be by means of external switch, manually operated, or by relay control from an automatic controller. Power requirement to raise the gate is 200 VA for fiberglass arms.

The SMB Mechanism uses gravity to drop the gate without power down. Downward velocity of gate arm is controlled by an adjustable snub resistor. The gate arm normally can be raised manually, but can be provided with additional contact and circuit to provide brake application to lock the gate in the lowered position.

Cast aluminum gate arm supports are mounted on each end of the main shaft. They are adaptable for mounting of either wood, fiberglass, or fiberglass/aluminum gate arms.

The cast cabinet is designed to mount directly on a five inch mast; however, adapters can also be furnished for mounting on four or eight inch masts.

MODEL SMB GATE MECHANISM ASSEMBLY

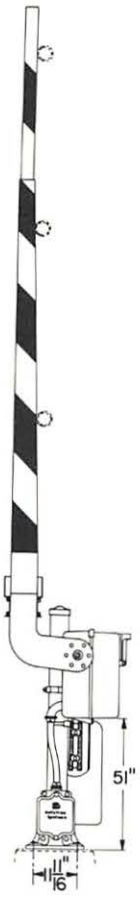


MODEL SMB GATE MECHANISM REPLACEMENT PARTS

To Order: Specify Description and Part Number

Item No.	Description	Qty. Req.'d	Part Number
1	Cap Screw, Hex Head, 3/8"-16 x 1.25"	4	4089-HSC
2	Washer, Spring Lock, M, 3/8"	12	1810-MSC
3	Casting, Buffer Cap	2	070902-1
4	Gasket, Buffer Cap	2	070926-1
5	Buffer, Top Assembly	1	070903-X
6	Buffer, Bottom Assembly	1	070903-2X
7	Cap Screw, Hex Head, 3/4"-10 x 6"	4	4286-HSC
8	Washer, Wrought, 3/4"	4	1758-C
9	Connector, Relief, 3/4"	1	7354
10	Casting, Aluminum Saddle	2	070950
11	Bolt, Eye, 1/2" x 1.5	1	7099
12	Washer, Wrought, 1/2"	1	1755-SC
13	Washer, Sealing	1	070980-4
14	Bearing, Roller	2	070587-A
15	O-Ring, 2"	2	070585
16	Gasket, Seal Plate	2	070747-3
17	Casting, Aluminum Plate	2	070544-3
18	Washer, Spring Lock, M, 5/16"	8	1809-MSC
19	Cap Screw, Hex Head, 5/16"-18 x .75"	8	4044-HSC
20	Nut, Slot	4	070950-1
21	Housing, Gate	1	070900-13
22	Cap, Plug	8	070986
23	Plate, Latch Assembly	1	070919-3X
24	Cap Screw, Socket Head, 1/4"-20 x .875"	10	4003-SSC
25	Bracket, Cam	5	070633-A
26	Cam, Contact Assembly	5	070633-2X
27	Pin, Dowel, 1/4" x 1"	1	1123-S
28	Key	1	070547
29	Key, Woodruff, #UX	2	7149
30	Set Screw, Socket Head, 1/2"-13 x .375"	2	4704-SC
31	Set Screw, Socket Head, 1/2"-13 x .50"	1	4706-SC
32	Gear, Main Segment	1	070545-2
33	Washer, Spring Lock, M, 1"	2	1817-MSC
34	Nut, Hex, 1" - 14	2	2119-SC
35	Shaft, Main	1	070543
36	Ring, Retaining	2	070584
37	Nut, Hex, 1/2"-13	1	2108-SC
38	Washer, Spring Lock, M, 1/2"	4	1812-MSC
39	Bolt, Hinge	1	070968-2
40	Nut, Hex, 3/8"-16	6	2154-SC
41	Bushing, Vent	4	041913-X
42	Nut, Hex, 3/8"-16	4	2104-SC
43	Washer, Wrought, 3/8"	2	1753-C
44	Connector, Elbow	1	070232
45	Conduit, Flexible	1	070692
46	Connector, Straight	1	070233
47	Cap Screw, Socket Head, 3/8"-16 x 1.75"	6	4091-SSC
48	Washer, Shakeproof Lock, E, 3/8"	6	1860-ESC
49	Housing, Gear	1	070910-2
50	Machine Screw, Round Head, #8-32 x .375"	3	2572-RSC
51	Washer, Spring Lock, M, #8	3	1805-MSC
52	Relay, Gate Assembly	1	070941-X
53	Gear, Gate	1	070548-BX
54	Gear, Gate	1	070548-2X
55	Spacer, Tube	2	070550-2
56	Shim, Spring	2	070695-500X
57	Shaft, Gear	2	070550-1
58	Spacer, Tube	2	070550-3
59	Bearing	4	070588
60	Cover, Bearing	4	070553-A
61	Washer, Spring Lock, M, #10	22	1806-MSC
62	Machine Screw, Pan Head, #10-32 x .375"	16	2614-PSC
63	Machine Screw, Round Head, #10-32 x .5"	2	2616-RSC
64	Washer, Spring Lock, M, #10	22	1806-MSC
65	Washer, Flat, #10	4	1712-SC
66	Cover, Relay	1	070941-1
67	Machine Screw, Round Head, #10-32 x 1.5"	4	2624-RSC
68	Resistor, Adjustable	1	029602-6AX
69	Motor Assembly	1	070640-503X
70	Brake Assembly	1	070984-X
71	Machine Screw, Round Head, #10-24 x .75"	1	2595-RSC
72	Rectifier, HTT 8670	1	014000-8670X
73	Holder, Cover	1	070641-4
74	Cap Screw, Hex Head, 1/4"-20 x .5"	4	4000-HSC
75	Label, Warning	1	070980-2
76	Pinion Motor	1	070554-A
77	Set Screw, Socket Head, 1/4"-28 x .25"	2	4615-SC
78	Cap Screw, Hex Head, 1/2"-13 x 1.25"	3	4167-HSC
79	Rod, Latch	1	070919-2
80	Gasket	1	070559-A
81	Board, Terminal Assy.	1	070625-6X
82	Machine Screw, Round Head, 1/4"-20 x 1.50"	4	2665-RSC
83	Washer, Spring Lock, M, 1/4"	8	1808-MSC
84	Cover, Cabinet Assembly	1	070901-2X
85	Retainer, Hinge	1	070968-4
86	Machine Screw, Slotted Hex Head, 5/16"-18 x 2.5"	1	2692-HSC
87	Set Screw, Socket Head, 3/8"-16 x .50"	1	7860-SC
88	Handle, Lock Latch	1	070909-4
89	Decal, Wiring	1	070976
90	Cover, Brake	1	070641-5
91	Key, Woodruff, #10	2	7101

ORDERING INFORMATION



To Order: Specify the following:

1. Model SMB Industrial Gate. (Specify either 115VAC or 12VDC operation).
2. Base Type (See Section A-9).
3. Gate Arm Type and Length. (See Section A-6).
4. Gate Arm Lamps (See Section A-6).

MODEL SMB INDUSTRIAL GATE MECHANISM ONLY

Model SMB Gate Mechanism for 115VAC operation, order part number 070900-23X.
Model SMB Gate Mechanism for 12VDC operation, order part number 070900-26X.

For additional ordering information, see Section A-3.

Safetran Systems Corporation

Instruction & Maintenance

Model S

Railroad Highway Crossing Gate

Safetran Systems Corporation

Instruction & Maintenance

Railroad Highway Crossing Gate

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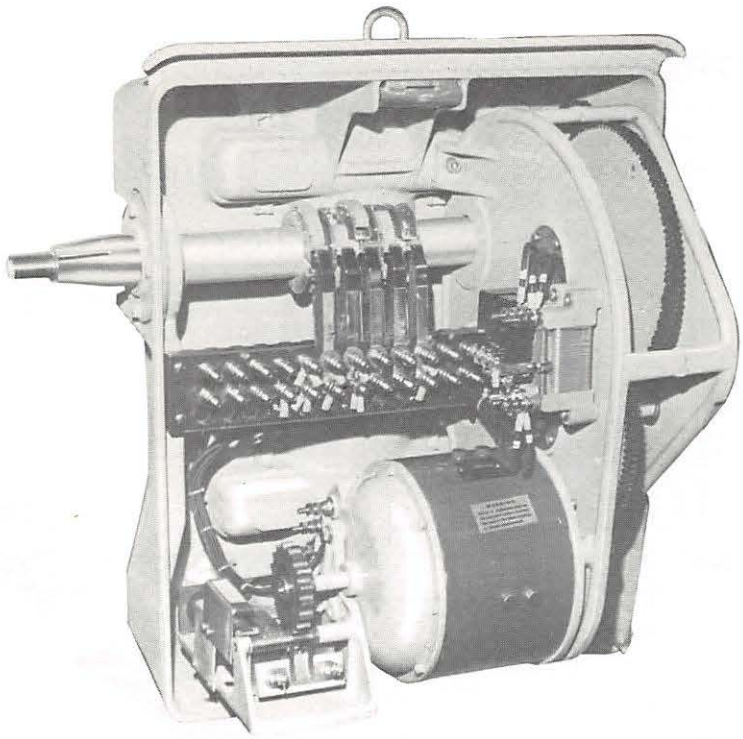
I&M 070892
Revised 2/84

Model S Mast Mounted Gate



Introduction

The Model S Gate, serving the Railroad industry for over a quarter of a century, now has a cast aluminum housing. Steel gears mounted on ball bearing shafts provide a smooth running 240 to 1 reduction gear train. Sealed ball bearings on these shafts are factory lubricated and require no further maintenance.

The gear train is powered by a 12-volt motor designed and built for this mechanism to operate the longest, properly counterbalanced gate arms smoothly and rapidly-even when arms are covered with sleet. During motor-up cycle, current consumption is 6-15 amperes, with an applied voltage of not less than 11 volts at the motor terminals.

During the motor-down cycle, current consumption is 6-15 amperes with an applied voltage of not less than 11 volts at the motor terminals.

The hold clear device, mounted on the end of the motor shaft, is an over-running clutch which will latch the gate in the vertical position when the electro-magnet is energized.

Holding the gate arm in the vertical position requires 34 milliamps at 12 volts.

Adjustable circuit controller cams are mounted on the shaft. Contact springs are mounted on a terminal board, forward in the assembly for ease of adjustment, inspection and maintenance.

Cast aluminum gate arm supports are mounted on each end of the main shaft. They are adaptable for mounting of either wood or fiberglass gate arms.

Gate mechanism may be ordered with factory installed auxiliary shaft, for application of sidewalk arm where required.

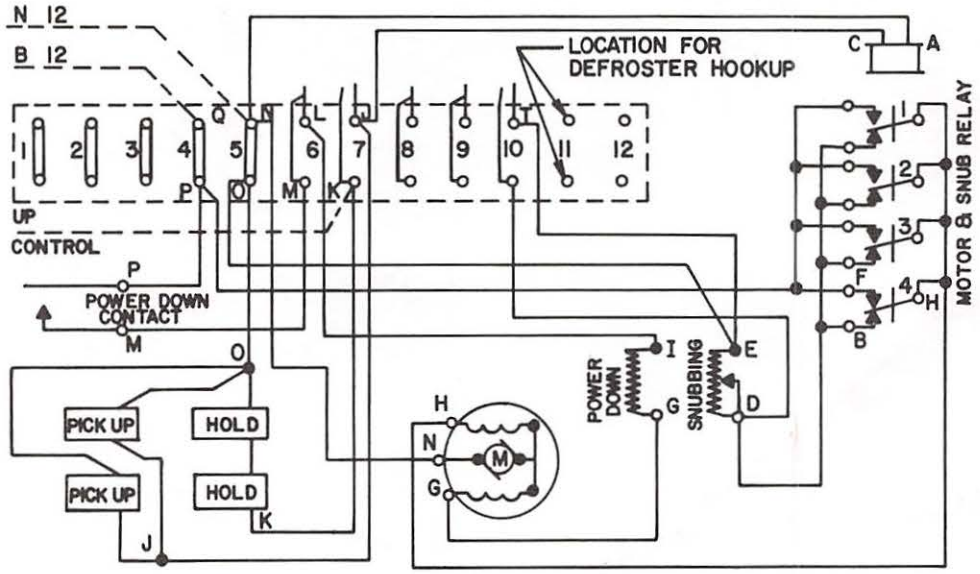
The cast cabinet is designed to mount directly on a five-inch mast, however, adapters can also be furnished for mounting on four- or eight-inch masts.

Serial numbers are located on the motor identification tag and on the vent protruding from the rear of the gate mechanism cabinet.

Model S Gate Wiring Diagram

(Shown with mechanism in vertical position)

CONTACTS CLOSED AT	FUNCTION
6. 45°-90°	POWER DOWN
7. 0°-89°	POWER UP
8. 83°-90°	FLASHING LIGHT (SPARE)
9. 5°-90°	BELL (SPARE)
10. 0°- 5°	HORIZONTAL SNUB



Recommended Battery and Wire Requirements

Sizes of wire used for the motor circuit should be calculated so that there will be not more than 0.1 ohm resistance between the battery and mechanism terminals.

Wire sizes as follows are recommended:

Distance from Battery Terminals to Mechanism Terminals	Size of Soft Drawn Copper Wire to Use
Up to 60 feet (120 feet of wire)	No. 9 AWG
From 60 to 120 feet (240 feet of wire)	No. 6 AWG

The following battery is recommended with above wire sizes for gates of various lengths:

Gate Arm Length in Feet	Number of Cells		
	Lead	Nickel Iron	Nickel Cadmium
Up to 24	6	9	9
25 to 42	7	11	11

Defrosters

Ordering Information

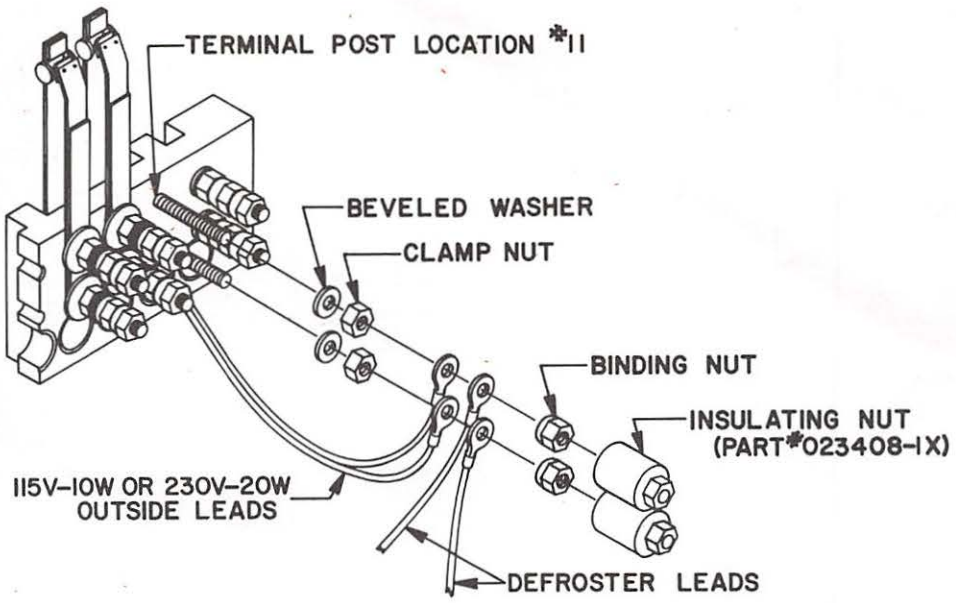
When planning installations in areas where frost accumulation on mechanism contacts might be expected, thought should be given to providing 2 wires in cable to permit operation of defroster.

Defroster (115 VAC Operation) Part # 070698-4X
Defroster (230 VAC Operation) Part # 070698-5X

Installation

Using contact terminal posts at position II on terminal board (see wiring diagram, page 2), connect the two terminal rings as shown in illustration below. Position the heating element directly under the commutator and brushes, located on the bottom side of the motor toward the operating end. Wrap the remaining wire around the outside circumference of the motor end. Attach the wire to the motor end cover with clips provided.

WARNING: Observe caution in handling 115/230 VAC primary connections. Make initial primary connections with power off.



Foundations

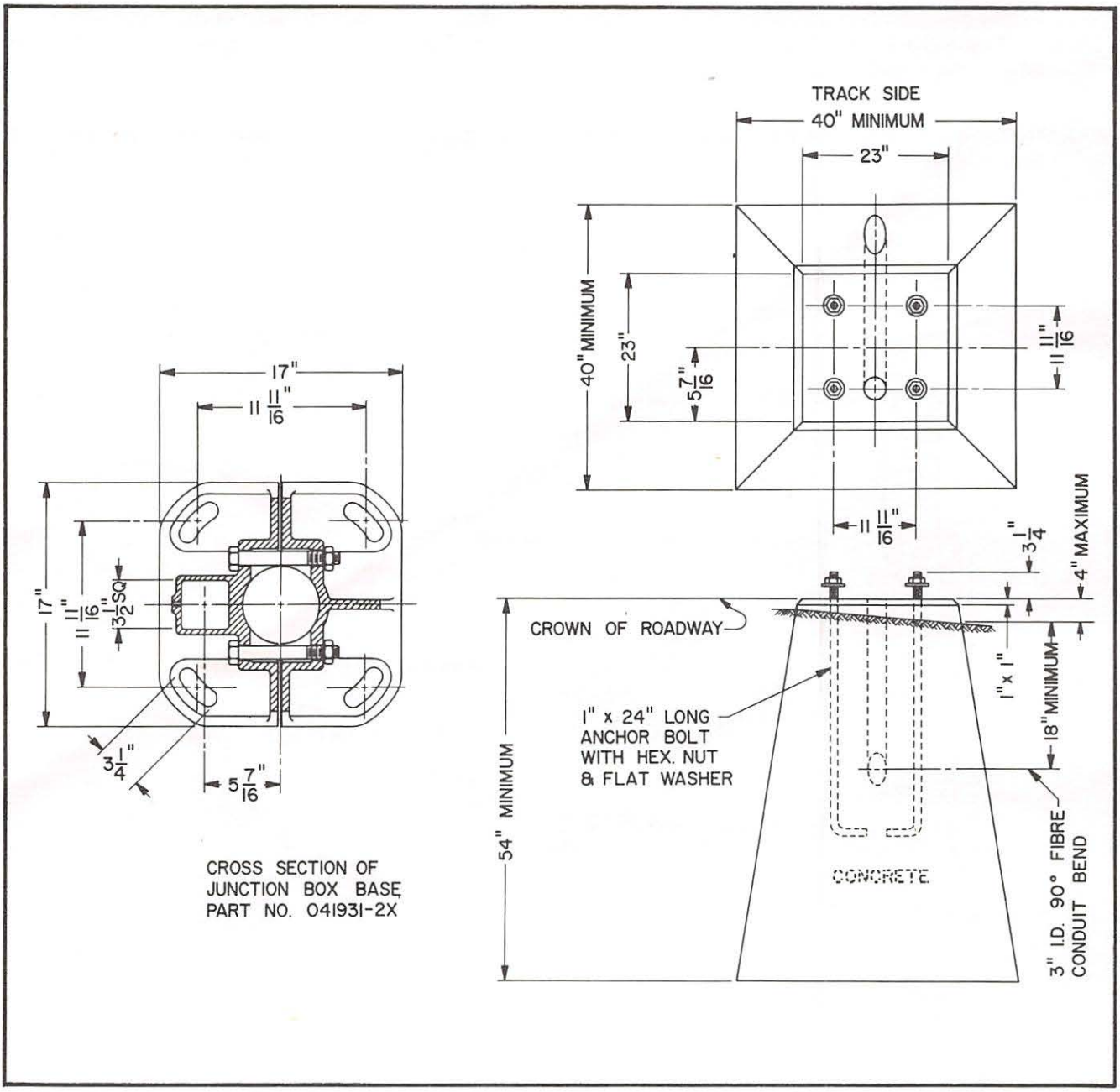
Galvanized steel prefabricated or poured concrete may be used for the foundation.

When using Safetran's galvanized steel foundation, Part Number 035903-911-1X, be sure bottom of excavation is flat and level to insure full support to the base plate. Backfill shall be compacted, with height of exposure above ground as shown for concrete below.

Place foundation as dictated by local conditions, remembering that gate arm lengths are measured from center of foundation to end of arm.

For field poured concrete foundation, 4 anchor bolts, Part Number 131702-5X, are required.

The recommended size of concrete foundation is shown in drawing below.



CROSS SECTION OF
JUNCTION BOX BASE
PART NO. 041931-2X

Installation

1. Erect five-inch mast, with junction box on base facing traffic. Mounting hole for normal front and/or back flashing lights will be on the field side of mast.
2. Thread flex conduit coupling into top of junction box base, and 90° coupling into back of gate cabinet.
3. Mount mechanism support clamp assembly, Part Number 070786-5X, on mast with casting facing 45° from field side toward track. Top of casting should be placed 51" above top of foundation.
4. Insert four (4) slot nuts, Part Number 070950-1, in back of cabinet. (See page 16, item number 20.)
5. Set gate mechanism on top of support clamp assembly, fasten to mast with clamps, Part Number 070950, and bolts provided. (See page 16, item number 10.)
6. Install cast aluminum gate arm supports which have mounting hubs bolted in place. Locate on keyed main shaft loosely, do not tighten nuts on main shaft securely until gate arm coupling has been bolted in place.
7. Bolt bendable coupling (for wood gate arms) or conversion bracket (for Fiberglass or Fiberglass/Aluminum Gate Arms) in place securely.
8. Tighten nuts on ends of main shaft.
9. Install flex conduit from rear of gate housing to coupling on top of junction box base.
10. Mount flashing lights on main mast. The flashing light units have been factory wired into their junction box, control wires from the junction box to junction box base must be field installed. When crossing is placed in service align lamps to provide maximum indication for approaching vehicles.
11. Bell, when used, is mounted on top of mast with gong facing roadway. A spare contact is provided on the controller to cut-off bell when gate arm is down. (See wiring diagram, page 2).
12. Mount required signs with hardware furnished.
13. Swing gate mechanism parallel to roadway, mount gate arm with gate arm lamps installed and wired. For safety, the gate arm should be held in horizontal position while applying counterweights. Counterweights furnished in accordance with table listings on page 11 are based on fiberglass or wood arms as manufactured by Safetran. Weights for other gate arms may vary due to construction and/or materials used.
14. Adjust descending time by adjustment of resistor ED. To cause gate arm to lower faster, increase resistance. (See wiring diagram, page 2).
15. Follow set-up adjustment card furnished with each gate mechanism.

Recommended Clearing Time	
Gate Arm Length in feet	**Clearing Time in seconds**
Up to 24	6
25 to 36	6 to 8
37 to 40	8 to 10

General Maintenance

Current S gate mechanisms have self-lubricating bearings on the main shaft but some older models require greasing bearings on main shaft. Also grease auxiliary sidewalk shaft bearings if gate is so equipped, with a multi-viscosity grease, such as Texaco "Low Temp, Grease EP".

Coat gears with a thin film of grease, such as Graphite Gredag, Grade 32.

The above should be done on a 3 to 6 month interval depending on number of gate operations.

Motor

The armature shaft is equipped with ball bearings packed at the factory with a special all weather grease. The bearings are sealed and lubrication of the motor is not required. The brush pressure should be between 8 to 10 ounces. Excessive pressure may result in brushes wearing too rapidly, while lack of pressure will result in arcing of the brushes, together with loss of power and excessive carbon deposits on the motor commutator. Lack of sufficient brush pressure may also result in failure of the gate to raise if weather conditions have caused frost to accumulate on the commutator surface. Normally the brush pressure, as adjusted at the factory, will be retained within proper limits throughout the long life of the brushes.

Other than an occasional check of the brush pressure, the only maintenance required is cleaning the commutator with a lint free cloth if it has become blackened by carbon deposits from the brushes.

Motor and Snub Relay

The motor and snub relay, bolted to the side of the large gear plate, has four front and back contacts, connected in parallel. Removable plastic cover allows for contact inspection. During clearing of the gate the relay is energized with front contacts closed to complete the motor up circuit. Relay is de-energized when contact number two at terminal board position #7 on the controller opens. With back contacts closed, it controls the snubbing on descent of the gate.

Field adjustments of this relay are not recommended. Relays failing to pick-up at nine volts should be replaced. The replacement number for the new relay is 070941-2X.

Hold Clear Ratchet

Mechanisms shipped from our factories after November 1, 1978 contain a new type factory lubricated hold clear ratchet assembly, Part Number 070658-8X. This ratchet is packed at the factory with a special all-weather grease and no further lubrication should be required.

Hold Clear Adjustments

The "Hold Clear" function is to hold the arm in a vertical position with power applied, but allowing the arm to descend when power is removed. This is achieved by an over-running clutch with an outer serrated ring, which is latched by an electro-magnetically operated roller and lever while energy is maintained on the coils.

Four coils are used in the electro-magnet. The two hold clear coils are wired in series for a total resistance of 356 ohms. The two pick-up coils have a resistance of 12.5 ohms each, connected in parallel to achieve a 6.25 ohm resistance. The hold clear armature is factory adjusted to release with a full load (gate vertical) at approximately 4.0 volts. Allowable tolerance on this release is from 4.0 to 6.4 volts and shall be readjusted when the full load release drops below 4.0 volts. Maximum pick-up is 7.0 volts.

The release is adjusted by increasing or decreasing the spring tension on the armature. Tighten nuts to increase drop away, loosen to decrease. Cotter pins must be replaced after adjustments. All moving parts should have appreciable end play in their respective supports. When the hold clear is released, the gap between the roller in the armature assembly and the serrated ring should not be less than 1/32". With hold clear energized there should be a clearance of .010"/.020" between the roller and the bottom of the notch in the serrated ring.

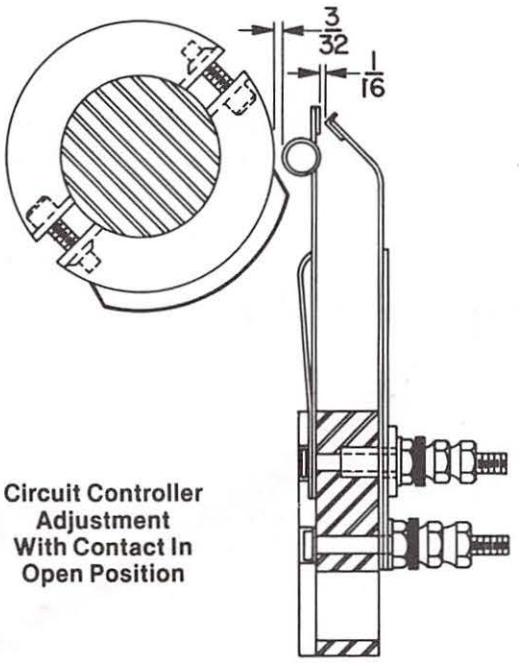
The power down contact is mounted on the hold clear assembly, and is actuated by movement of the armature. With the armature de-energized there should be a clearance of .015"/.020" between the end of the contact spring and the actuator. Contact spring pressure should be 100 grams. When energized, contact opening should be .050" minimum.

Circuit Controller Adjustment

Five spring contacts are normally provided on each assembly. There is space available to add two additional contacts if necessary. Three are required for regular operation of gate mechanism. Contacts 8 and 9 are spare, these are factory adjusted and may be used as indicated in the table below.

When contact is in the open position, adjustment can be maintained between cams on the main shaft and operating block as per drawing below.

Where adjustment becomes necessary, such as cam #2 at terminal board position #7 to control the vertical position of the arm, loosen screw with allen wrench. With wrench in screw socket, use as lever to shift cam position, then tighten screw.



Circuit Controller Adjustment With Contact In Open Position

Term. Board Position Number	Wire Designation	Contact Closed At	Function of Contact
6	L-M	45°-90°	Power Down Control
7	J-K	0°-89°	Power Up Control
8	R-S	83°-90°	Spare (Suggest Flashing Light Control)
9	V-W	5°-90°	Spare (Suggest Bell Control)
10	T-U	0°- 5°	Horizontal Snub Control

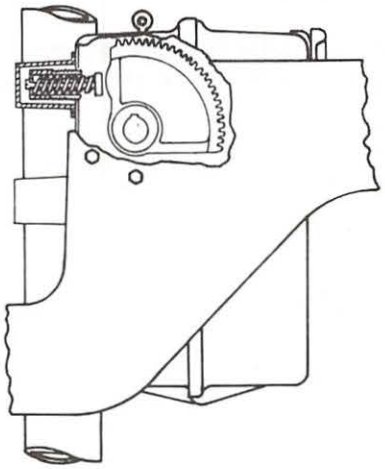
Spring Buffer Adjustment

The Model S gate mechanism is equipped with an adjustable spring buffer for horizontal and vertical gate arm positioning. They are factory adjusted; however, if field adjustment is necessary, follow instructions below.

Horizontal Position

The horizontal buffer controls the height of gate arm above the highway.

To adjust horizontal position; remove cap from rear of housing, loosen lock nut, turn threaded sleeve to raise or lower arm as required. Retighten lock nut and replace cap.



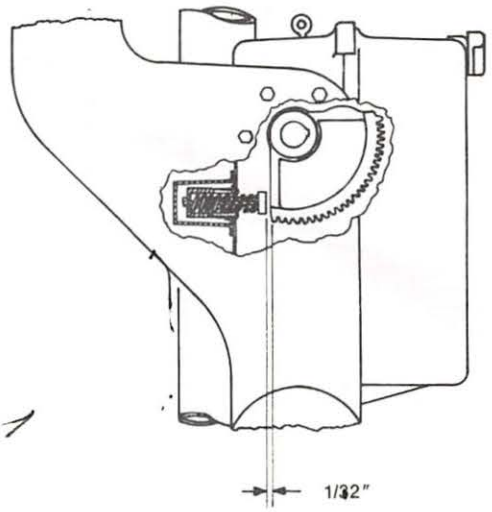
Vertical Position

Factory adjustment provides 1/32″ clearance between the buffer pad and segment gear, based on arm at full 90° position. If gate arm is to be positioned at less than 90°, the vertical buffer should be readjusted at time of installation.

To adjust, remove lower cover cap from the rear of the gate cabinet, loosen lock nut and adjust threaded sleeve until contact with the segment gear is obtained. Backing off sleeve approximately 1/3 turn will provide 1/32″ clearance.

After adjusting, secure lock nut and replace cap.

Note: This adjustment should always be checked before placing gate in service.



Installation of Steel Counterweights

Install Steel Counterweights as follows:

1. With gate arm mounted in the horizontal position, install the counterweight stud assembly (Item 4, page 22) on support gate arm using two counterweight bolt ratchets (Item 8, page 22) and two each: ¾" wrought washers, ¾" spring lock washers, and ¾" hex nuts.

2. Place proper amount of steel counterweights on plate stud assembly.

   The number of counterweights required (and other mounting materials) is determined by the type and length of gate arm used. (See tables 1 and 2 on page 11.)

NOTE: Counterweights for fiberglass arms up to 32' and wood arms up to 25' are mounted on one counterweight support arm.

Counterweight Requirements

	Gate Arm Length in Feet	Counter-Weights Required	Stud Plate Assy. 070757	Distance "X" in Feet	Scale Reading Range (lbs.)		Torque Range (ft.-lbs.)	
					Min.	Max.	Min.	Max.
Counter-weights mounted on one Support Arm	12'-16'	1	-26X	5'	35	37	175	185
	17'-20'	2	-26X	5'	35	37	175	185
	21'-24'	3	-26X	5'	35	37	175	185
	25'-26'	4	-26X	5'	38	42	190	210
	27'-28'	4	-26X	6'	36	39	215	235
	29'-30'	5	-26X	6'	40	44	240	260
	31'-32'	5	-26X	7'	38	41	265	285

Table 1 — Fiberglass Gate Arm Vertical Torque

	Gate Arm Length in Feet	Counter-Weights Required	Stud Plate Assy. 070757	Distance "X" in Feet	Scale Reading Range (lbs.)		Torque Range (ft.-lbs.)	
					Min.	Max.	Min.	Max.
Counter-weights mounted on one Support Arm	13'-18'	2	-26X	5'	35	37	175	185
	19'-24'	4	-26X	5'	35	37	175	185
Counter-weights mounted on two Support Arms	25'-26'	7	-26X	5'	38	42	190	210
	27'-28'	7	-26X	5'	43	47	215	235
	29'-30'	7	-26X	6'	40	44	240	260
	31'-32'	10	-26X	7'	38	41	265	285
	33'-34'	10	-26X	7'	41	44	290	310
	35'-36'	10	-26X	8'	40	42	315	335
	37'-38'	16	-24X	9'	38	40	340	360
	39'-40'	16	-24X	10'	36	38	365	385
	41'-42'	16	-24X	10'	39	40	390	400

Table 2 — Wood Gate Arm Vertical Torque

Note: All arms 31 feet and longer are shipped with a truss assembly.

Torque Adjustments
(Using Safetran Torque Wrench Kit)

Safetran's Torque Wrench Kit permits measurements to be taken from the 1/2 inch hexagon end of the motor shaft. It provides a simpler method than the conventional manner with a spring scale for both measurements.

The torque wrench is calibrated to allow for both inch-pound and foot-pound readings to be taken through the 240 to 1 gear reduction from the 1/2 inch hexagon end of the motor shaft. Other torque wrenches should not be used.

The torque adapter, included in the torque wrench kit, provides for torque adjustments to be made on older model gates. The adapter consists of a hex shaft made onto a collar which fits over the end of the motor pinion, and is held in place by a set screw.

The Safetran Torque Wrench Kit, Part Number 070981-X, consists of:

- Torque Wrench (calibrated for both inch-pound and foot-pound readings through the 240 to 1 gear reduction)
- Ratchet Wrench (3/8 inch drive)
- Ratcheting Box End Wrench (1/2 and 9/16 inch openings)
- Socket (1/2 inch, 3/8 inch drive)
- Torque Adapter
- Hex Key Wrench (3/16 inch)
- Tool Box

Horizontal Torque

1. To obtain horizontal torque, disconnect power to the gate and allow arm to lower to the horizontal position.
2. Lift the gate arm approximately 5 degrees from the horizontal position.
3. Attach the torque wrench to the hexagon end of the motor shaft and allow wrench to rotate until blocked by housing.
4. The value read should be between 50 and 100 foot-pounds. If reading does not fall in this range, counterweights should be moved in either direction, as shown on page 13 of this manual, until proper reading is obtained. Remove torque wrench before adjusting counterweights.
5. When proper reading is obtained, remove torque wrench and reapply power.

Vertical Torque

1. To obtain vertical torque, operate the gate mechanism to place the arm in the vertical position.
2. Place the torque wrench over the motor shaft with wrench as far clockwise and as far toward motor as possible.
3. Holding the torque wrench firmly, disconnect power-up and power-down circuits. Slowly allow wrench to rotate until blocked by casting. Make certain that the gate arm is not resting against the vertical spring buffer pad.
4. The value read should be in accordance with the torque range specifications as listed in tables on page 11 of this manual for the proper length gate arm.
5. If reading does not fall within specifications, counterweights should be moved horizontally in either direction, as shown on page 13 of this manual, until proper reading is obtained. Remove torque wrench before adjusting counterweights. When proper reading is obtained, remove wrench and reapply power.

Hand Cranking of Gate Mechanism

Warning: Disconnect power to gate mechanism before inserting tools for hand cranking.

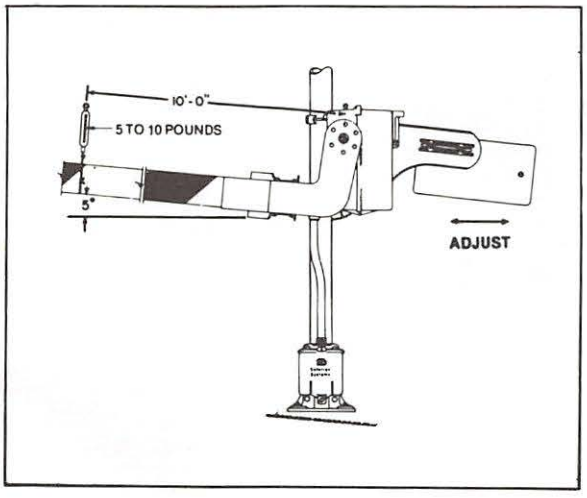
The gate mechanism hand crank feature may be used either to crank the gate arm up, or in the case where the arm has been sheared off, to crank the counterweights to the horizontal position. The tools required are a ratchet wrench with 3/8 inch square drive, a 1/2 inch socket for 3/8 inch drive, and a ratcheting box end wrench for 1/2 inch hex shaft; all of which are included in the Safetran Torque Wrench Kit.

1. Place ratcheting box end wrench over the hexagon shaft and slide towards motor. The ratchet should be set in the direction to prevent its rotation backward.
2. Place the ratchet wrench over the end of the hexagon shaft and crank in the desired direction. The mechanism may be held in the desired position by the ratchet wrench.

Torque Adjustments (Using Spring Scale)

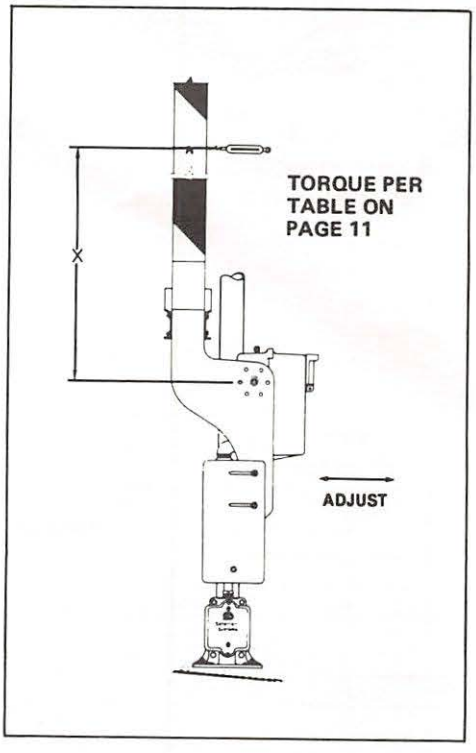
Horizontal Torque

With counterweights properly mounted on Gate Arm Support(s), adjust counterweights for proper horizontal torque as shown below. Horizontal torque should be at least 50 foot-pounds and not more than 100 foot-pounds.



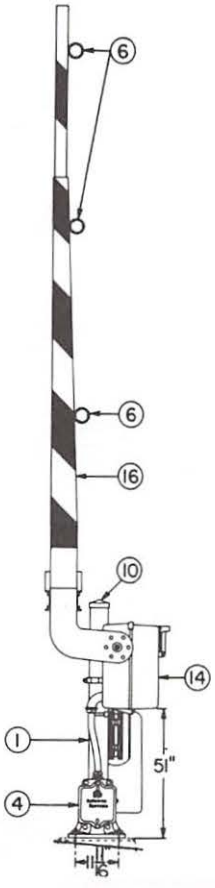
Vertical Torque

Allow gate to clear and latch. Attach spring scale as shown at right. Open power down and power up circuits by disconnecting battery to mechanism or by blocking controller contacts, allowing gate to fall (about 5°) against scale. Adjust counterweights for proper vertical torque. Torque values will vary with length of arm. Use tables 1 or 2 to determine proper torque value and measuring point on gate arm. Adjust counterweights for proper scale reading.

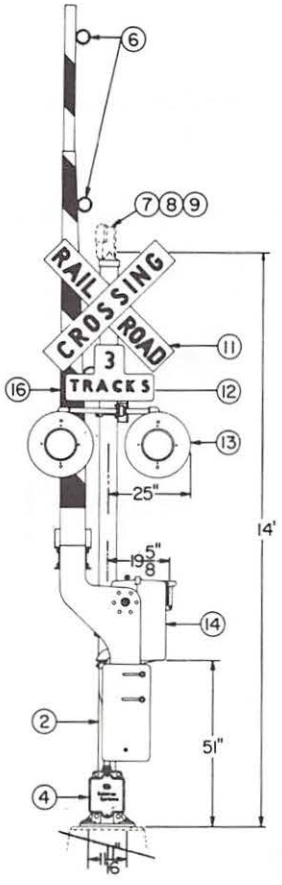


NOTE: Voltage on gate motor during up cycle should not be less than 11.0 volts nor more than 16.0 volts measured at motor terminals. If voltage exceeds 16.0 volts, it is possible gate will over drive and not latch at the clear position.

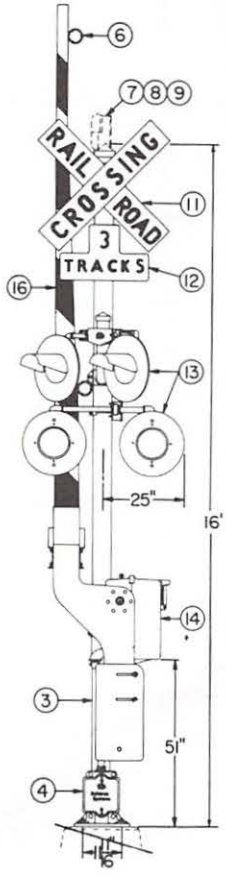
Model S Gate Types 50, 51, and 52 Replacement Parts

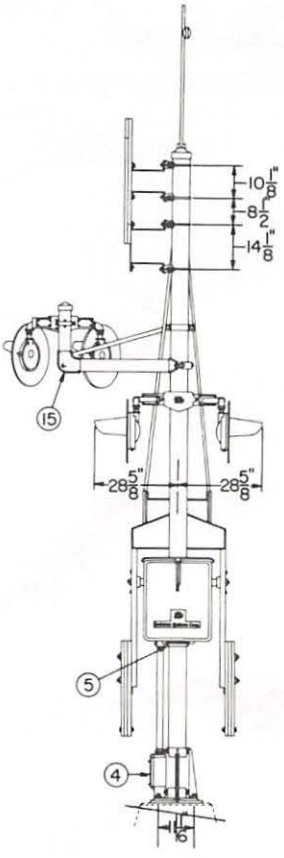


Type 50
S gate mounted on stub mast



Type 51
S gate with front and/or back flashing lights.



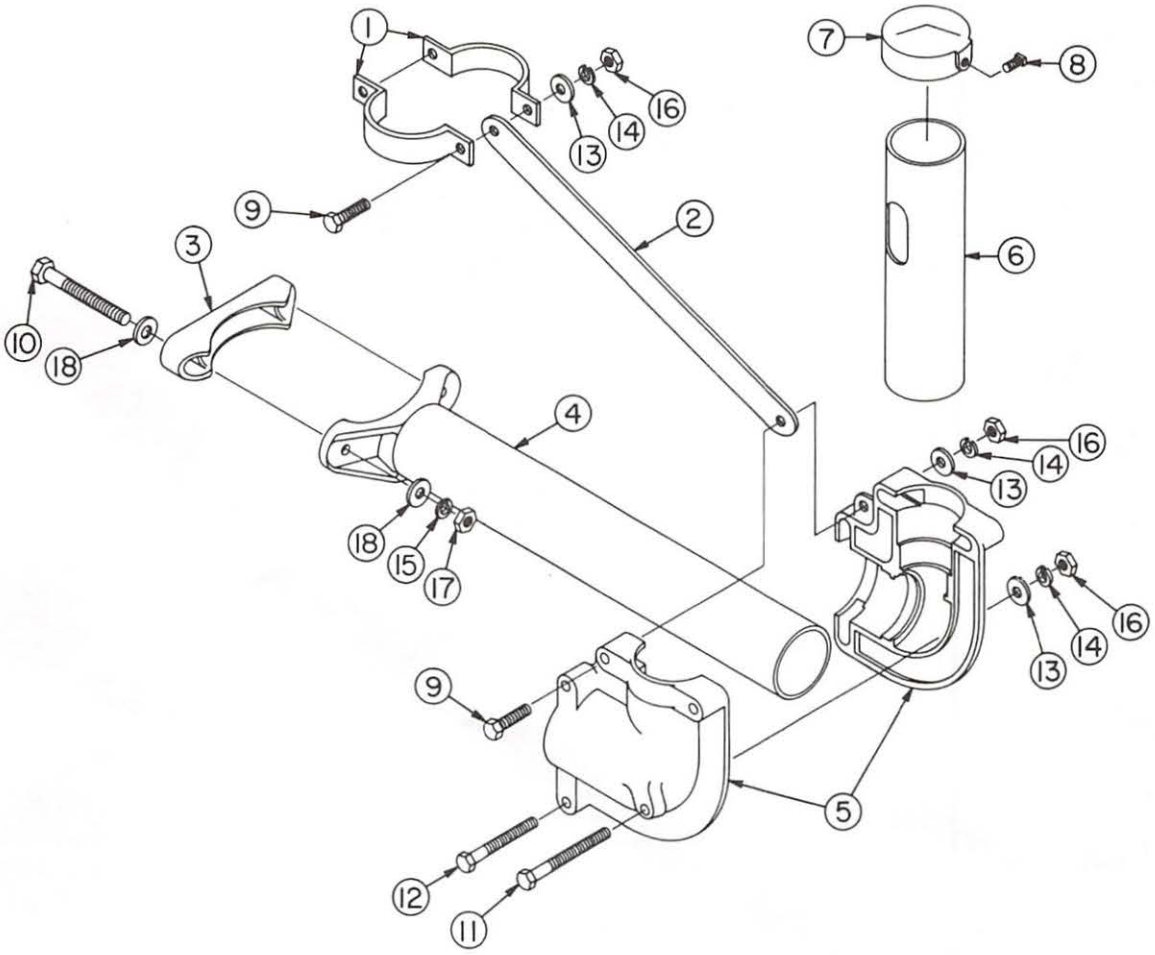


Type 52
S gate with front and/or back flashing lights and cantilever mounted sidelights.

To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Mast, 5" Stub	070519-3A
2	Mast, 5" Standard	070519-27A
3	Mast, 5", for Front, Back, and 45° Left Lights	070519-44A
4	Base, Junction Box, 11-11/16" Bolt Spacing for 5" Pipe	041931-2X
5	Clamp, Mechanism Support	070786-5X
6	Lamp, Gate Arm	075950-500X
7	Bell, 8-12 VDC Operation, for 5" Mounting	040200-4X
8	Bell, 120 VAC Operation, for 5" Mounting	040200-8X
9	Bell, 12-16 VAC/10-12 VDC Operation, for 5" Mounting	040200-10X
10	Pinnacle, 5"	035045-503X
11	Sign, Railroad Crossing, for 5" Mounting	035200-17X
12	Sign, Track, for 5" Mounting, (specify # of tracks)	035235-(#)X
13	Lamp, Flashing — See flashing lamp section of catalog.	Specified
14	Mechanism, S Gate	070900-12X
15	Cantilever, Sidelight (Required for left hand sidelights)	041442-26X
16	Arm, Gate — See gate arm section of catalog.	Specified

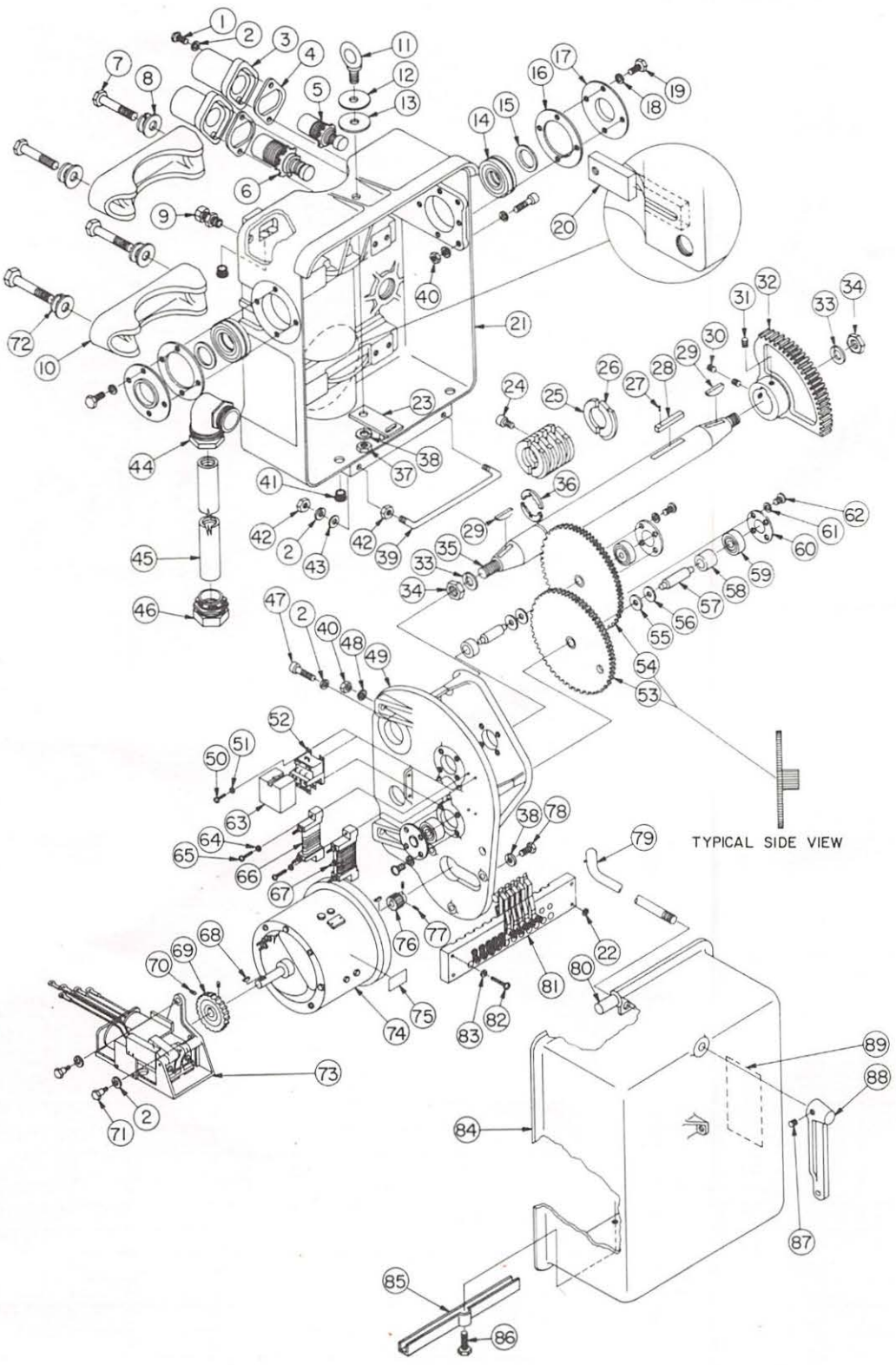
Sidelight Cantilever
Assembly and Replacement Parts



For Complete Assembly, Order Number 041442-26X

To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Clamp, Pipe, 5"	2	035015-A
2	Bar, Support	1	041442-30
3	Casting, Aluminum Clamp	1	070950
4	Pipe, Lower	1	041442-25X
5	Casting, Aluminum Elbow	2	041442-26
6	Pipe, Upper	1	041442-29
7	Pinnacle, 4"-5"	1	035045-502
8	Set Screw, Square Head, 3/8"- 16 x 1"	1	4932-SC
9	Cap Screw, Hex Head, 1/2"-13 x 2"	3	4170-HSC
10	Cap Screw, Hex Head, 3/4"-10 x 6"	2	4286-HSC
11	Cap Screw, Hex Head, 1/2"-13 x 6"	1	4182-HSC
12	Cap Screw, Hex Head, 1/2"-13 x 5"	4	4180-HSC
13	Washer, Wrought, 1/2"	8	1755-C
14	Washer, Spring Lock, M, 1/2"	8	1812-MSC
15	Washer, Spring Lock, M, 3/4"	8	1815-MSC
16	Nut, Hex, 1/2"-13	8	2108-SC
17	Nut, Hex, 3/4"-10	2	2114-SC
18	Washer, Flat, 3/4"	4	1737-SC

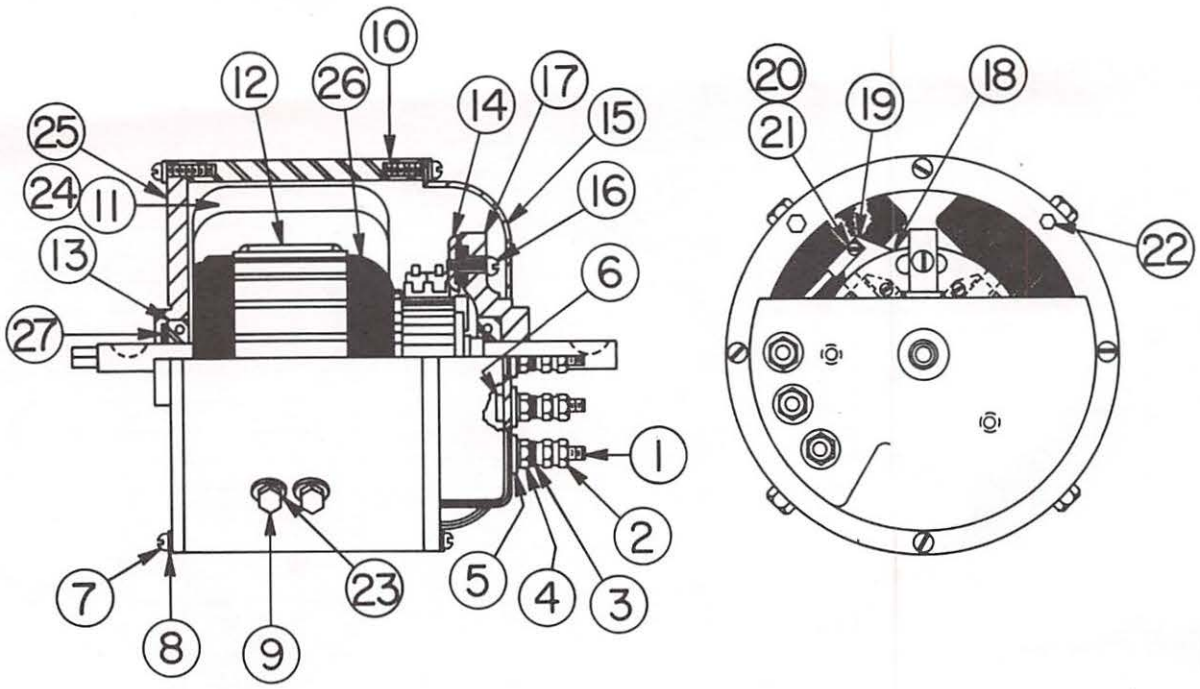

TYPICAL SIDE VIEW

Model S Gate Mechanism Assembly and Replacement Parts

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req.'d	Part No.
1	Cap Screw, Hex Head, 3/8"-16x1.25"	4	4089-HSC
2	Washer, Spring Lock, M, 3/8"	22	1810-MSC
3	Casting, Buffer Cap	2	070902-1
4	Gasket, Buffer Cap	2	070926-1
5	Buffer, Top Assembly	1	070903-X
6	Buffer, Bottom Assembly	1	070903-2X
7	Cap Screw, Hex Head, 3/4"-10 x 6"	4	4286-HSC
8	Washer, Wrought, 3/4"	4	1758-C
9	Connector, Relief, 3/4"	1	7354
10	Casting, Aluminum Saddle	2	070950
11	Bolt, Eye, 1/2" x 1.5	1	7099
12	Washer, Wrought, 1/2"	1	1755-SC
13	Washer, Sealing	1	070980-4
14	Bearing, Roller	2	070587-A
15	O-Ring, 2"	2	070585
16	Gasket, Seal Plate	2	070747-3
17	Casting, Aluminum Plate	2	070544-3
18	Washer, Spring Lock, M, 5/16"	8	1809-MSC
19	Cap Screw, Hex Head, 5/16"-18 x .75"	8	4044-HSC
20	Nut, Slot	4	070950-1
21	Housing, Gate	1	070900-13
22	Washer, Lock, I, 1/4"	2	1858-ISN
23	Plate, Latch Assembly	1	070919-3X
24	Cap Screw, Socket Head, 1/4"-20 x .875"	10	4003-SSC
25	Bracket, Cam	5	070633-A
26	Cam, Contact Assembly	5	070633-2X
27	Pin, Dowel, 1/4" x 1"	1	1123-S
28	Key	1	070547
29	Key, Woodruff, #UX	2	7149
30	Set Screw, Socket Head, 1/2"-13 x .375"	2	4704-SC
31	Set Screw, Socket Head, 1/2"-13 x .50"	1	4706-SC
32	Gear, Main Segment	1	070545-2
33	Washer, Spring Lock, M, 1"	2	1817-MSC
34	Nut, Hex, 1" - 14	2	2119-SC
35	Shaft, Main	1	070543
36	Ring, Retaining	2	070584
37	Nut, Hex, 1/2"-13	1	2108-SC
38	Washer, Spring Lock, M, 1/2"	4	1812-MSC
39	Bolt, Hinge	1	070968-2
40	Nut, Hex, 3/8"-16	6	2154-SC
41	Bushing, Vent	4	041913-X
42	Nut, Hex, 3/8"-16	4	2104-SC
43	Washer, Wrought, 3/8"	2	1753-C
44	Connector, Elbow	1	070232
45	Conduit, Flexible	1	070692
46	Connector, Straight	1	070233
47	Cap Screw, Socket Head, 3/8"-16 x 1.75"	6	4091-SSC
48	Washer, Shakeproof Lock, E, 3/8"	6	1860-ESC
49	Housing, Gear	1	070910-2
50	Machine Screw, Round Head, #8-32 x .375"	3	2572-RSC
51	Washer, Spring Lock, M, #8	3	1805-MSC
52	Relay, Gate Assembly	1	070941-X
53	Gear, Gate	1	070548-BX
54	Gear, Gate	1	070548-2X
55	Spacer, Tube	2	070550-2
56	Shim, Spring	2	070695-500X
57	Shaft, Gear	2	070550-1
58	Spacer, Tube	2	070550-3
59	Bearing	4	070588
60	Cover, Bearing	4	070553-A
61	Washer, Spring Lock, M, #10	20	1806-MSC
62	Machine Screw, Pan Head, #10-32 x .375"	16	2614-PSC
63	Cover, Relay	1	070941-1
64	Washer, Flat, #10	4	1712-SC
65	Machine Screw, Round Head, #10-32 x 1.50"	4	2624-RSC
66	Resistor, Fixed	1	029604-11X
67	Resistor, Adjustable	1	029602-4BX
68	Key, Woodruff, #10	2	7101
69	Ratchet, Hold Clear	1	070658-8X
70	Set Screw, Socket Head, 1/4"-28 x .25"	2	4615-SC
71	Bolt, Mounting	2	075084
72	Washer, Spring Lock, M, 3/4"	4	1815-MSC
73	Hold Clear Assembly	1	070780-AX
74	Motor Assembly	1	070640-3DX
75	Label, Warning	1	070980-2
76	Pinion, Motor	1	070554-A
77	Set Screw, Socket Head, 1/4"-28 x .25"	2	4615-SC
78	Cap Screw, Hex Head, 1/2"-13 x 1.25"	3	4167-HSC
79	Rod, Latch	1	070919-2
80	Gasket	1	070559-A
81	Board, Terminal Assy.	1	070625-6X
82	Machine Screw, Round Head, 1/4"-20 x 1.50"	4	2665-RSC
83	Washer, Spring Lock, M, 1/4"	2	1808-MSC
84	Cover, Cabinet Assembly	1	070901-2X
85	Retainer, Hinge	1	070968-4
86	Machine Screw, Slotted Hex Head, 5/16"-18 x 2.5"	1	2692-HSC
87	Set Screw, Socket Head, 3/8"-16 x .50"	1	7860-SC
88	Handle, Lock Latch	1	070909-4
89	Decal, Wiring	1	070976

Motor
Assembly and Replacement Parts

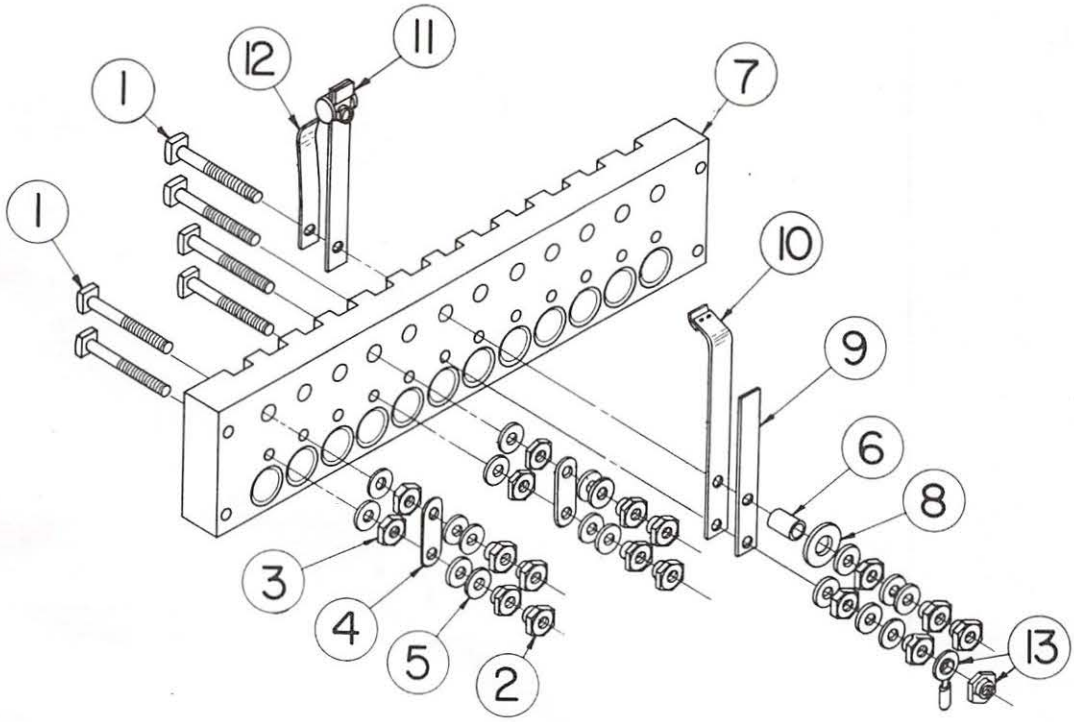


For Complete Assembly, Order Number 070640-3DX.

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req.'d.	Part No.	Item No.	Description	Qty. Req.'d	Part No.
1	Post, Binding	3	023833	15	Cover, End Motor	1	075119
2	Nut, Binding	6	023831	16	Machine Screw, Fillister Head, ¼"-20x.875"	8	2661-LSC
3	Washer, Beveled	15	023834				
4	Nut, Clamp	3	023832	17	End, Motor (Rear)	1	075118
5	Insulator, Lower	6	075123-1	18	Bracket, Assembly	1	075111-X
6	Insulator, Upper	3	075124-1	19	Brush, Motor Assembly	4	075116-X
7	Machine Screw, Fillister Head, ¼"-20x.875"	8	2661-LSC	20	Machine Screw, Round Head, #6-32x.500"	6	2559-RBN
8	Washer, Kant Link Lock, ¼"	1	1955	21	Washer, Cut, #6S	2	1704-B
9	Cap Screw, Hex Head, ⅜"-16x1"	8	4088-HSC	22	Machine Screw, Hex Head, #10-24x.25"	2	2589-HSC
10	Housing, Motor	1	075120	23	Washer, Shakeproof Lock, I. ⅜"	8	1860-ISC
11	Coil, Field Assembly	1	075178-X	24	Tape, Insulator	8	075133-1
12	Pole, Field Assembly	1	075108-X	25	End, Motor	1	070689-C
13	Bearing, Ball	2	075142	26	Armature, Assembly	1	070682-BX
14	Clamp, Bracket	1	075117	27	Spacer	1	070695-500

Terminal Board
Assembly and Replacement Parts

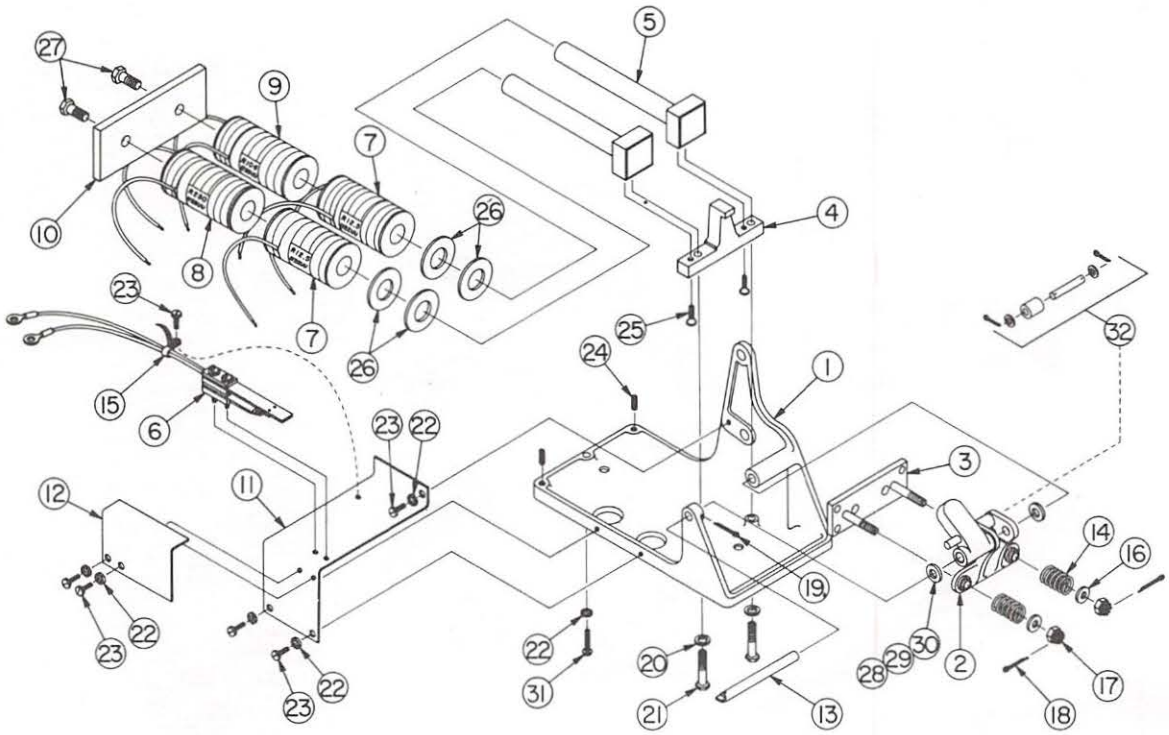


For Complete Assembly, Order Number 070625-6X.

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req.'d.	Part No.	Item No.	Description	Qty. Req.'d	Part No.
1	Post, Terminal	24	010427-6	8	Washer, Insulating	5	070627
2	Nut, Binding	48	023831	9	Spring, Reinforcing	5	070628
3	Nut, Clamp	24	023832	10	Contact, Fixed	5	070629-X
4	Connector	5	023839-2	11	Contact, Movable	5	070630-IX
5	Washer, Beveled	72	023834	12	Finger, Reinforcing	5	070632
6	Bushing, Insulating	5	041414	13	Eyelet, Test Assembly	1	024628-IX
7	Casting, Terminal Board	1	070625				

Hold Clear
Assembly and Replacement Parts

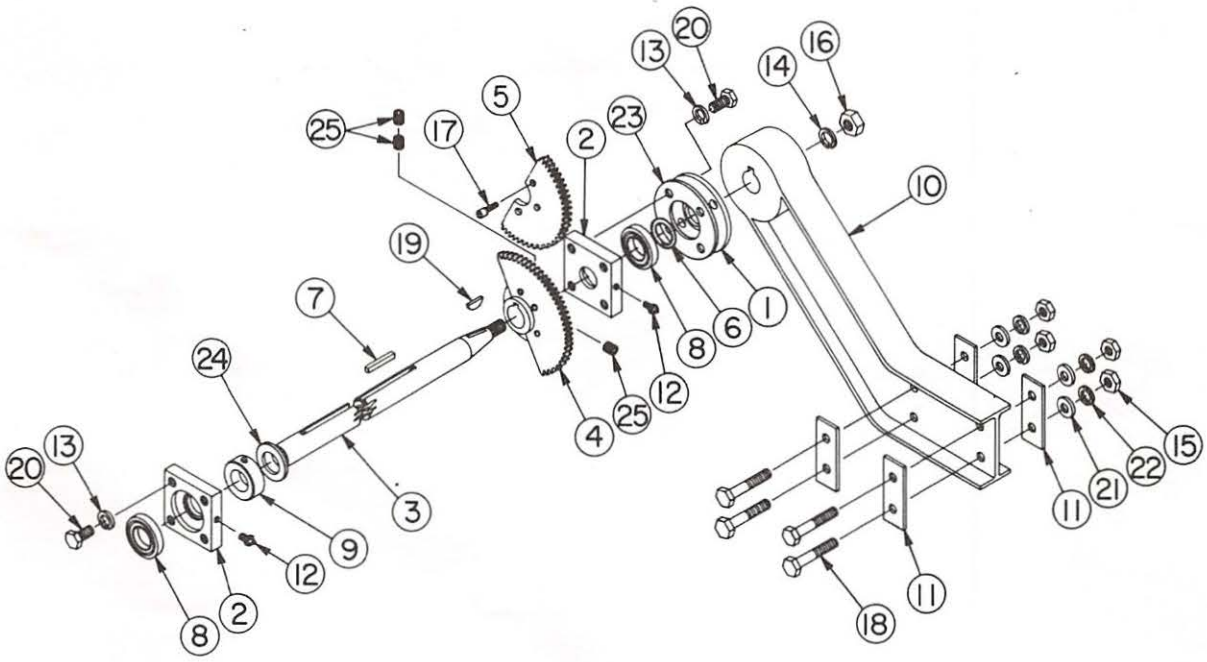


For Complete Assembly, Order Number 070780-AX.

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req.'d.	Part No.	Item No.	Description	Qty. Req.'d	Part No.
1	Frame, Hold Clear	1	070780-C	21	Cap Screw, Hex Head, 1/4"-28x1.25"	2	4026-HE
2	Bracket, Armature	1	070649-BX				
3	Armature Assembly	1	070647-X	22	Washer, Spring Lock, M, #10	6	1806-MSC
4	Stop, Hold Clear	1	070662-A				
5	Core, Hold Clear	2	070646-A	23	Machine Screw, Pan Head, #10-32x.375"	6	2614-PSC
6	Contact, Power Down	1	070777-2AYX				
7	Coil, Pick Up, (12.5 ohm)	2	070665-1X	24	Set Screw, Socket Head, #10-32x.5"	2	7852
8	Coil, Hold Clear (250 ohm)	1	070665-X				
9	Coil, Hold Clear, (106 ohm)	1	070665-3X	25	Machine Screw, Flat Head, #10-32x.5"	2	2616-FBN
10	Yoke, Hold Clear	1	070645-A				
11	Support, Contact	1	070770-A	26	Washer	4	040524-A
12	Plate, Cover	1	070770-1	27	Cap Screw, Hex Head, 5/16"-18x.75"	2	4044-HE
13	Pivot, Armature	1	070652				
14	Spring, Compression	2	070651	28	Washer, .063"	4	070653
15	Tie, Cable	1	18-04-002	29	Washer, .032"	4	070653-1
16	Washer, Shoulder	2	1980-F	30	Washer, .010"	4	070653-2
17	Nut, Castle, 1/4"-28	2	2494-SN	31	Machine Screw, Round Head, #10-32x.875"	1	2620-RBN
18	Pin, Cotter, 1/16"x.5"	2	1000-BN				
19	Pin, Cotter, 1/16"x.75"	1	1001-SC	32	Kit, Hold Clear Shaft and Roller	1	070665-5X
20	Washer, Spring Lock, M, 1/4"	2	1808-ME				

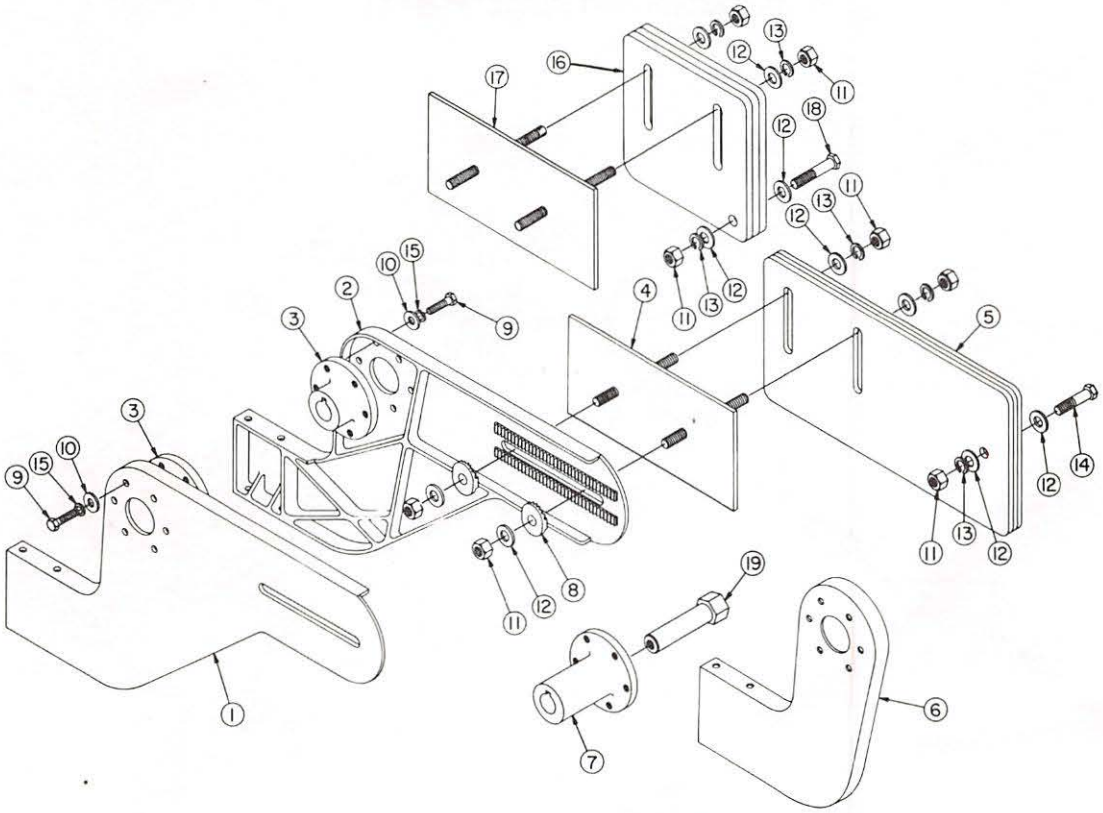
Auxiliary Shaft and Support for Sidewalk Arms Replacement Parts



To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Plate, Seal	1	070566-1
2	Housing, Bearing	2	070567
3	Shaft, Sidewalk Arm	1	070568
4	Gear, Sidewalk Arm	1	070569-AX
5	Gear, Top	1	070569-2
6	O-ring, 1¼"	1	070585-1
7	Key	1	070595
8	Bearing	2	070596
9	Collar, Set Screw	1	070597
10	Support, Sidewalk Arm	1	070759-X
11	Plate, Washer	4	070763
12	Fitting, Grease	2	110333-8A
13	Washer, Spring Lock, M, ½"	12	1812-MSC
14	Washer, Spring Lock, M, ⅝"	1	1814-MSC
15	Nut, Hex, ⅜"-16	4	2104-SC
16	Nut, Hex, ⅝"-18	1	2113-SC
17	Cap Screw, Socket Head, ⅜"-16x1.25"	3	4089-SSC
18	Cap Screw, Hex Head, ⅜"-16x2.75"	4	4095-HSC
19	Key, Woodruff,	1	7102
20	Cap Screw, Hex Head, ½"-20x1"	8	4185-HSC
21	Washer, Wrought, ⅜"	4	1753-C
22	Washer, Spring Lock, M, ⅜"	4	1810-MSC
23	Gasket	1	070747-2
24	Washer, Wrought, 1¼"	1	1762-C
25	Set Screw, Socket Head, ⅜"-16x.312"	3	4655-SC

Gate Arm Supports / Counterweights Replacement Parts



To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Support, Left Hand Gate Arm	070920-L
2	Support, Right Hand Gate Arm	070920-R
3	Hub, Gate Arm Support	070923-3
4	Plate, Stud (for wood arms 13' - 36' and all fiberglass arms)	070757-26X
	Plate, Stud (for wood arms 37' - 42')	070757-24X
5	Counterweight, Steel, 1/2" x 15" x 30", 63 lbs.	070755-4
6	Support, Left Hand Gate Arm, for use without counterweights	070921-L
7	Hub, Extended (for sidewalk arms)	070575-1X
8	Ratchet, Counterweight Bolt	070924
9	Cap Screw, Hex Head, 1/2"-13 x 1.25"	4167-HSC
10	Washer, Wrought, 1/2"	1755-C
11	Nut, Hex, 3/4"-10	2114-SC
12	Washer, Wrought, 3/4"	1758-C
13	Washer, Spring Lock, M, 3/4"	1815-MSC
14	Cap Screw, Hex Head, 3/4"-10 x 2" (for 1 - 2 c'wts.)	4274-HSC
	Cap Screw, Hex Head, 3/4"-10 x 3" (for 3 - 4 c'wts.)	4278-HSC
	Cap Screw, Hex Head, 3/4"-10 x 4" (for 5 - 6 c'wts.)	4282-HSC
	Machine Bolt, Hex Head, 3/4"-10 x 6.5" (for 7 - 10 c'wts.)	3177-SC
15	Washer, Spring Lock, M, 1/2"	1812-MSC
16	Counterweight, Steel, 5/8" x 15" x 15"	070755-34
17	Plate, Stud (for wood arms to 36' and all fiberglass arms)	070757-30X
	Plate, Stud (for wood arms 37' - 46')	070757-31X
18	Cap Screw, Hex Head, 3/4"-10 x 2.5" (for 1 - 3 c'wts.)	4276-HSC
	Cap Screw, Hex Head, 3/4"-10 x 5" (for 3 - 7 c'wts.)	4284-HSC
	Machine Bolt, Hex Head, 3/4"-10 x 7.5" (for 8 - 10 c'wts.)	3179-SC
	Machine Bolt, Hex Head, 3/4"-10 x 14" (for 11 - 20 c'wts.)	3190-SC
19	Nut, Extended (for sidewalk arms)	070579

Safetran Systems Corporation

Safetran Systems Corporation
4650 Main Street N.E.
Minneapolis, Minnesota 55421

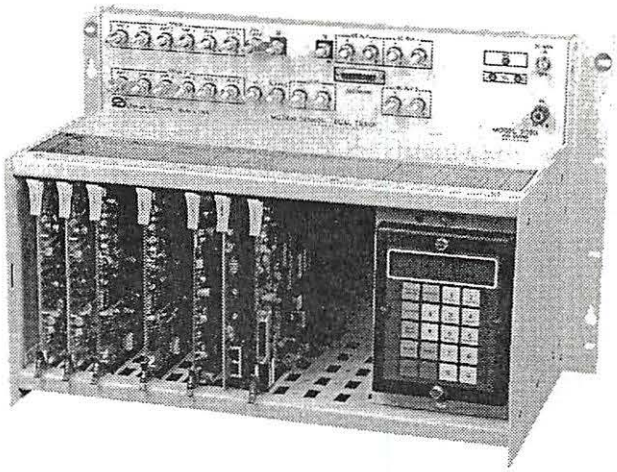
612/572-0466

Section B

Safetran

MOTION SENSOR
MODEL 2000

- Available in both nonredundant and redundant systems
  - Nonredundant system provides two track, independent T1/T2 frequency operation
  - Redundant system provides single-track operation
- Poor shunting software is standard
- Except for the processor module, uses all standard 3000 GCP modules
- Programmable frequencies
- Fully automated calibration
- Programmable remote start operation
- Front panel UAX and Enable inputs
- Front panel terminals accommodate both four and six-wire operation



Non-Redundant Model 2000 Motion Sensor
Part Number 80080

Using the technological foundation of Safetran's Model 3000 Grade Crossing Predictor, the Model 2000 Motion Sensor offers circuitry and software proven in over a decade of service experience.

The Model 2000 Motion Sensor is available in two configurations: a nonredundant system (part number 80080) and a redundant system (part number 80090). The nonredundant system is designed for two-track installations and provides independent programming of transmit frequencies for track 1 and track 2. The redundant system is designed for use in single-track installations. The transmit frequencies for both systems are field programmable. By using an external automatic transfer timer unit (80024), two nonredundant units can also operate as a redundant system.

Both Model 2000 Motion Sensor units are equipped with Safetran's poor shunting detection software to ensure proper crossing operation in areas of light train traffic where the rails can become coated with a thin layer of rust.

With the exception of the processor module, the Model 2000 Motion Sensor uses all standard Model 3000 GCP modules. The Model 2000 Motion Sensor is equipped with a new 80224 processor module. Programming is greatly simplified and system calibration requires performing only a single automated setup procedure. The Model 2000 Motion Sensor is also programmable to operate from a remote location. Both the Enable and UAX input terminals are available for more complex applications. Remote six track wire operation is also available via front panel AAR terminals.

SPECIFICATIONS

Input:

Voltage	9.0-16.5 VDC; 12 VDC nominal
Current	Single-track system - 1.50 amps Two-track system - 2.3 amps Optional modules up to 0.65 amp each Maximum current - 2.95 amps
Transmitter Output Current:	250 mA nominal on medium power; up to 500 mA on high power; varies with frequency
Program Selection:	Keystroke entry via keyboard/display - Program is displayed by LCD readout
Frequency Available	Frequencies can be programmed between 45 and 999 Hz in 1 Hz increments. Independent frequencies can be programmed for track 1 and track 2 (non-redundant model only, part number 80080-XXX)
Frequency Stability:	±0.01 percent
Island Frequencies Available	The 80211 island module provides 2.14, 2.63, 3.24, 4.0, 4.9, 5.9, 7.1, 8.3, 10.0, 11.5, 13.2, 15.2, 17.5, and 20.2 kHz.
Island Circuit Length:	Determined by island track wire connections - 120 feet (36 meters) minimum to 350 feet (106 meters) maximum
Relay Drive Outputs:	400 to 1,000-ohm load
Surge Protection:	Built-in surge protection for track and battery connections. Requires only primary arresters and equalizers.
Diagnostics and Monitoring:	Accomplished via two-line, 16-character, alphanumeric, liquid crystal display. Diagnostic information, application programming and train move data plus internal voltages are displayed.
Mounting:	The 2000 MS can be wall, rack, or shelf mounted. All track, power, and slaving connections use standard AAR termnals.
Dimensions:	**Model 2000 and 2000S2:** 23 inches (58.4 cm) wide 11.34 inches (28.8 cm) deep 14.36 inches (36.5 cm) high
Weight:	**Model 2000** (all modules in place) 22 pounds (9.9 kg) (approximate)
Temperature Range:	-40 degrees F to +160 degrees F (-40 degrees C to +71 degrees C)
Operating Distance:	Tables 1 and 2 indicate minimum and maximum bidirecional and unidirectional approach lenghts, respectively, for each standard Safetran 2000 MS operating frequency with ballast resistances of 2, 4, and 6 ohms per 1,000 feet. Maximum operating distances for any given frequency are governed by ballast resistance conditions, increasing with higher ballast and decreasing with lower ballast. Minimum approach distances are determined by available system gain. The minimum approach distance figures indicate the shortest approach distance over which a given frequency will operate.

Table 1

Ballast Resistance vs. Approach Length by Frequency, Bidirectional Applications

2000 MS Operating Frequency (Hz)	Bidirectional Approach Length (Feet)					
	2 Ohms/1,000 Feet Distributed Ballast		4 Ohms/1,000 Feet Distributed Ballast		6 Ohms/1,000 Feet Distributed Ballast	
	Minimum *	Maximum	Minimum *	Maximum	Minimum *	Maximum
86	1000	5100	1000	7600	1000	9280
114	750	4300	750	6100	750	7448
156	600	3750	600	5200	600	6349
211	475	3200	475	4500	475	5494
285	400	2800	400	3900	400	4762
348	400	2500	400	3400	400	4151
430	400	2200	400	3100	400	3785
525	400	2050	400	2900	400	3541
645	400	1850	400	2600	400	3175
790	400	1650	400	2300	400	2808
970	400	1475	400	2025	400	2472

*Based on use of hardwire or wideband shunts

Table 2

Ballast Resistance vs. Approach Length by Frequency, Unidirectional Applications

2000 MS Operating Frequency (Hz)	Unidirectional Approach Length (Feet)					
	2 Ohms/1,000 Feet Distributed Ballast		4 Ohms/1,000 Feet Distributed Ballast		6 Ohms/1,000 Feet Distributed Ballast	
	Minimum *	Maximum	Minimum *	Maximum	Minimum *	Maximum
86	700	4200	700	5900	700	7080
114	525	3700	525	5300	525	6360
156	420	3200	420	4600	420	5520
211	400	2650	400	3900	400	4680
285	400	2150	400	3300	400	3960
348	400	1850	400	2850	400	3420
430	400	1650	400	2500	400	3000
525	400	1450	400	2150	400	2580
645	400	1250	400	1850	400	2220
790	400	1075	400	1550	400	1860
970	400	1000	400	1425	400	1710

*Based on use of hardwire or wideband shunts

ORDERING INFORMATION

MODEL 2000 MOTION SENSOR, NON-REDUNDANT SYSTEM

Description	Part Number
Basic Model 2000 MS, Single-Track Operation (non-redundant) Includes one (1) each of the following: Case, 80081, Intelligent Processor Island Module, 80211, Transceiver module, 80012, Relay Drive module, 80013, Processor module, 80224, Control Interface module, 80020	80080-001
Basic Model 2000 MS, Single-Track Operation (non-redundant) with Data Recorder Module, 80115**	80080-003
Basic Model 2000 MS, Single-Track Operation (non-redundant) with keyboard	80080-005
Basic Model 2000 MS, Single-Track Operation (non-redundant) with keyboard plus Data Recorder Module, 80115**	80080-007
Basic Model 2000 MS, Single-Track Operation (non-redundant) with Data Recorder Interface Module, 80255	80080-013
Basic Model 2000 MS, Single-Track Operation (non-redundant) with keyboard plus Data Recorder Interface Module, 80255	80080-017

Description	Part Number
Basic Model 2000 MS, Two-Track Operation (non-redundant) Includes the following: Case, 80081 (1), Intelligent Processor Island Module, 80211 (2) Transceiver module, 80012 (2) Relay Drive module, 80013 (1) Processor module, 80224 (1), Control Interface module, 80020 (1)	80080-002
Basic Model 2000 MS, Two-Track Operation (non-redundant) with Data Recorder Module, 80115**	80080-004
Basic Model 2000 MS, Two-Track Operation (non-redundant) with keyboard	80080-006
Basic Model 2000 MS, Two-Track Operation (non-redundant) with keyboard plus Data Recorder Module, 80115**	80080-008
Basic Model 2000 MS, Two-Track Operation (non-redundant) with Data Recorder Interface Module, 80255	80080-014
Basic Model 2000 MS, Two-Track Operation (non-redundant) with keyboard plus Data Recorder Interface Module, 80255	80080-018

MODEL 2000S2 MOTION SENSOR, REDUNDANT SYSTEM

Description	Part Number
Basic Model 2000 MS, Single-Track Operation (redundant) Includes the following: Case, 80081 (1), Intelligent Processor Island Module, 80211 (2), Transceiver module, 80012 (2), Relay Drive module, 80013 (2), Processor module, 80224 (2), Control Interface module, 80020(1), Transfer module, 80028 (1)	80090-001
Basic Model 2000 MS, Single-Track Operation (redundant) with Data Recorder Module, 80115 (2)**	80090-002
Basic Model 2000 MS, Single-Track Operation (redundant) with keyboard (1)	80090-003
Basic Model 2000 MS, Single-Track Operation (redundant) with keyboard plus Data Recorder Module, 80115 (2) **	80090-004
Basic Model 2000 MS, Single-Track Operation (redundant) with Data Recorder Interface Module, 80255 (2)	80090-012
Basic Model 2000 MS, Single-Track Operation (non-redundant) with keyboard plus Data Recorder Interface Module, 80255 (2)	80090-014

** To record external relay functions, an 80025 Recorder Interface unit is required.

Safetran

GRADE CROSSING CONTROL

SECTION B

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Short Range Track Circuit (SRTC)	10
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Safetran Systems Corporation

OCT 1976

(REPRINTED MARCH 1980)

Instruction
& Maintenance

Model

7A191

SERIES OVERLAY TRACK CIRCUIT (SOTC)

PROPRIETARY INFORMATION

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SALES AND SERVICE LOCATIONS

Technical assistance and sales information on SAFETRAN products may be obtained at the following locations:

SAFETRAN SYSTEMS CORP.
7721 NATIONAL TURNPIKE
LOUISVILLE, KENTUCKY 40214
TELEPHONE: 502-361-1691
TWX: 810-535-3325

SAFETRAN SYSTEMS CORP.
ELECTRONIC DIVISION
9271 ARROW HIGHWAY
CUCAMONGA, CALIFORNIA 91730
TELEPHONE: 714-987-4673
TWX: 910-581-3824

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SAFETRAN
SERIES OVERLAY TRACK CIRCUIT (SOTC)
7A191

GENERAL

Safetran's Series Overlay Track Circuit (SOTC), Model 7A191, is a limited distance audio frequency track circuit intended primarily for obtaining release of electrically locked switches by occupying the main track immediately ahead of the switch points. This track circuit is packaged as a transceiver with transmitter, receiver and related circuitry mounted on a single $7\frac{1}{2}$" x 8" plug-in printed circuit module (7A190). The Series Overlay Track Circuit is available as a self-contained unit in its own housing or the module can be plugged into the PMTC Electric Switch Lock Release chassis in the Short Range Track Circuit Module position. Connection to the rails is made with two wires as shown on figure 1. The only other external connections required are two wires for 10 - 15 volt DC battery supply and two wires going to the relay driven by the unit. No external surge protection is required except primary arrestors and equalizers as shown on figure 1.

SPECIFICATIONS

Operating frequency	5900 Hz or 10,000 Hz
Input voltage	10 - 15 VDC
Input current	350 mA or less
Shunting zone (releasing section)	Adjustable up to 150 ft. each side of track connection
Ambient temperature range	-40° F to +160° F
Relay coil resistance	6 ohms to 1000 ohms

TRANSMITTER

The Overlay Track Circuit (see block diagram, figure 2, and schematic diagram, figure 5) contains a free-running multivibrator Q4 and Q5, which generates a square wave at 5900 Hz. The square wave signal is coupled through a buffer stage, Q6, to the driver stage, Q7. The positive voltage at the emitter of the driver transistor

is limited by diodes CR7 and CR8 to prevent overdrive of the power amplifier. The driver stage drives the power amplifier, Q8, which drives a tuned output transformer designed to match the transmitter impedance to the track. The resonant coupling circuit produces reliable operation over normally encountered ballast conditions.

Transistor Q1 provides a regulated voltage of approximately 5.5 VDC for the multivibrator and buffer circuits (Q4 through Q6). The resistance of R6 varies with the temperature thereby compensating for any frequency variations that would otherwise occur due to temperature changes. Resistors R11 and R12 and capacitors C1 and C2 determine the basic frequency of the multivibrator.

TUNED CIRCUITS

Capacitors C3 and C4 in parallel across the primary of transformer T1 tune the primary of the transformer for maximum signal output. Capacitors C5 and C6 (in parallel) are in series with inductor L1 and the secondary of T1 and tune T1 to the track impedance for maximum track signal. The voltage drop across series resistor R48 (1 ohm) provides the signal input to the receiver input transformer (T2).

RECEIVER

Signals from the receiver input transformer, T2, are filtered by the bandpass filter network consisting of inductors L2 and L3 and capacitors C7 through C14. The bandpass filter is isolated from the receiver by resistors R20 and R21 (3.9K and 10 ohms, respectively). Resistors R22 and R23 (47K-ohms each) at the input of operational amplifier (op amp) Z1 produce a balanced output from the op amp. The gain control, R24, varies the gain of the amplifier from approximately 4 to approximately 1. Capacitor C15 blocks the DC voltage to prevent changing the bias of Z1 when the gain of the amplifier is

varied by adjustment of R24. The output of Z1 may be up to 5.5 volts p-p, which is then fed into level detector Z2 (Schmitt trigger) with its input level set to 1/4 of the supply voltage by the ratio of resistors R29 and R30. When no signal is received, the output of Z2 is approximately ground potential. When the input to Z2 (from Z1) goes to 1 mV, or more positive than the voltage at pin 2 of Z2, the output of Z2 becomes positive. The output of Z2 is a square wave which is rectified by a peak detector, CR4 and CR5. The rectified DC output triggers a DC Schmitt trigger (Q10 through Q12). The Schmitt trigger introduces hysteresis into the receiver system to prevent relay chatter. Transistor Q13 is a buffer between the Schmitt trigger and the output, or relay driver, stage Q14. Current for the collector of Q14 is supplied through the coil of the normally deenergized external relay which should have a coil resistance of 500 to 1000 ohms. The relay becomes energized when a train occupies the track within the SOTC releasing section (see figure 1).

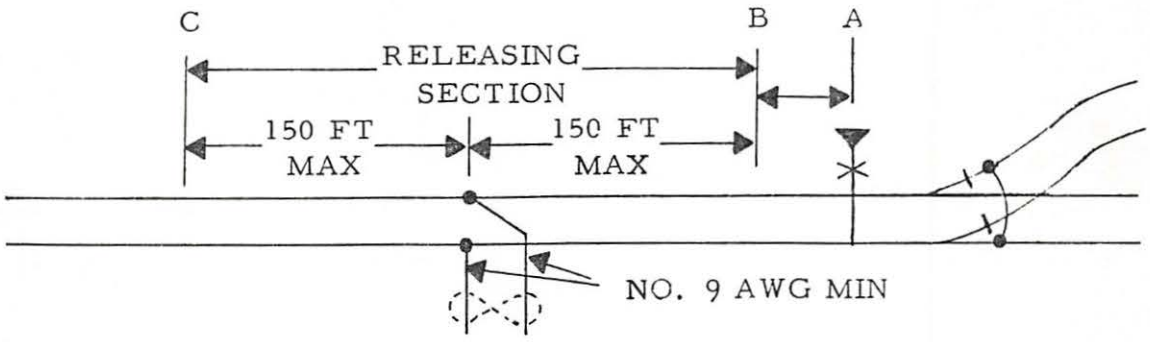
INSTALLATION AND ADJUSTMENT

Before proceeding with the installation and adjustment procedure outlined below, the following considerations should be noted:

1. Ballast resistance of 5 ohms or less concentrated very close to the switch points may significantly alter circuit performance, especially if the concentrated resistance varies from day to day.
2. Maximum total releasing section circuit length under very high ballast resistance conditions is approximately 300 feet, based on 150 feet in each direction from the rail connections.
3. The shorter the releasing section circuit length, the less effect low ballast resistance will have on the SOTC pickup point on the track.

TRACK WIRING

The determination of where the two SOTC track wires are to be connected to the track is found as follows



1. Based on user's standard practice, determine the distance between "A" and "B." "B" is the limit of the releasing section nearest the switch points. This distance is usually between 15 and 70 feet from the switch points. "B" also is where a shunt will cause relay OTR to just pick up when the circuit is properly adjusted.

2. The distance between "B" and "C" defines the releasing section and is based on user's standards for releasing sections but should not exceed 300 feet. Locate the mid-point between "B" and "C." This is where track wire connections to the rail should be made.
3. Track wiring should be as short as practical and should be #9 AWG or larger insulated copper wire and twisted two turns or more per foot. Total track wire resistance must not exceed 0.2 ohms. Use larger gauge wire or multiple conductors if needed to meet this requirement.

SOTC WIRING (See figure 1)

Connect the track wires to the "rail" terminals of the Series Overlay Track Circuit. Connect operating battery (10 - 15 VDC) to terminals marked B and N. Connect relay OTR to terminals marked RLY+ and RLY-.

CHECKOUT AND ADJUSTMENT OF SOTC

1. Place a hardwire shunt across the rail at B (see figure 1).
2. Remove cover of SOTC and adjust the gain control potentiometer, R24, so that the OTR relay just picks up. Verify that a shunt halfway between "A" and "B" does not pick up the relay.

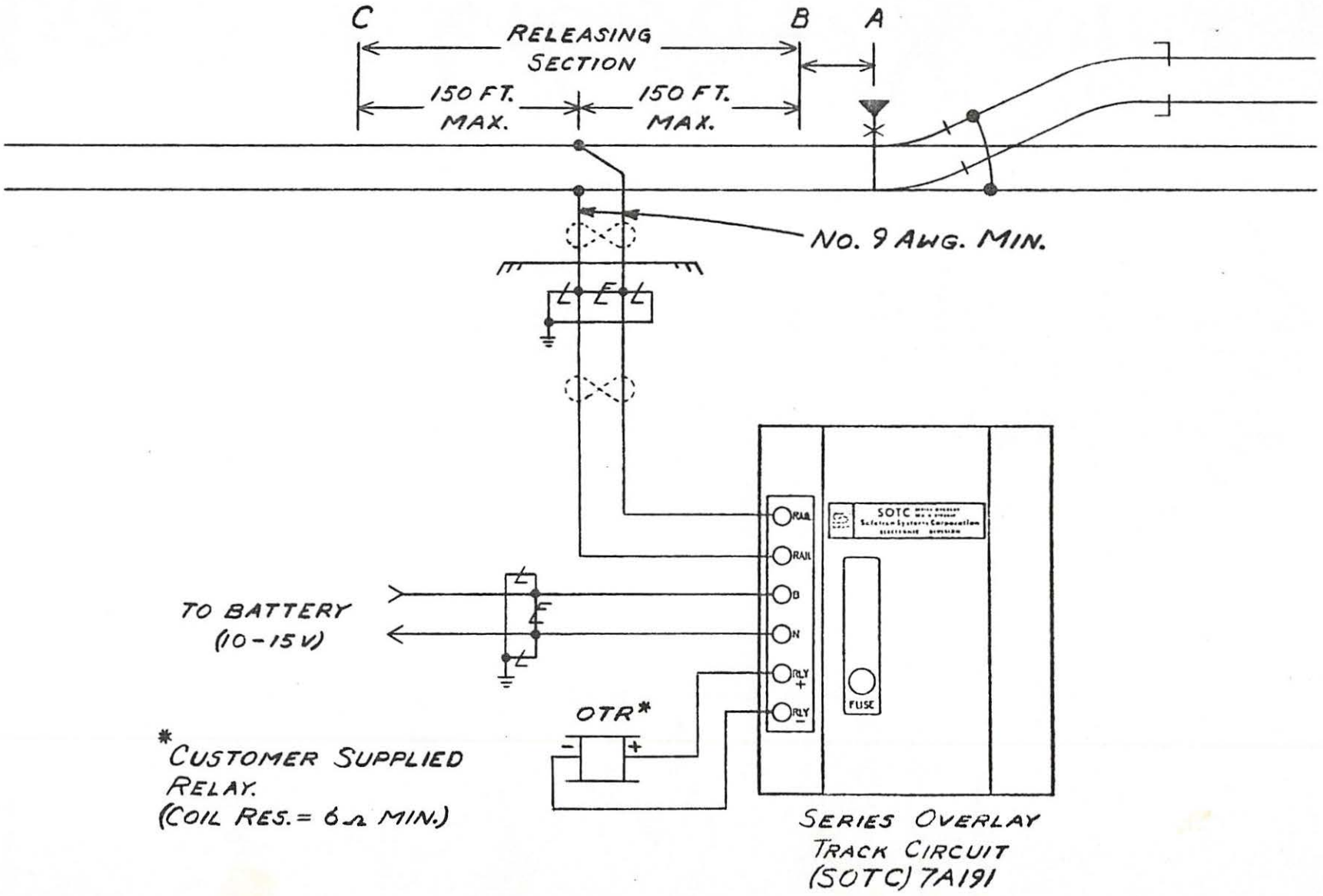


Figure 1. Typical SOTC Installation Plan

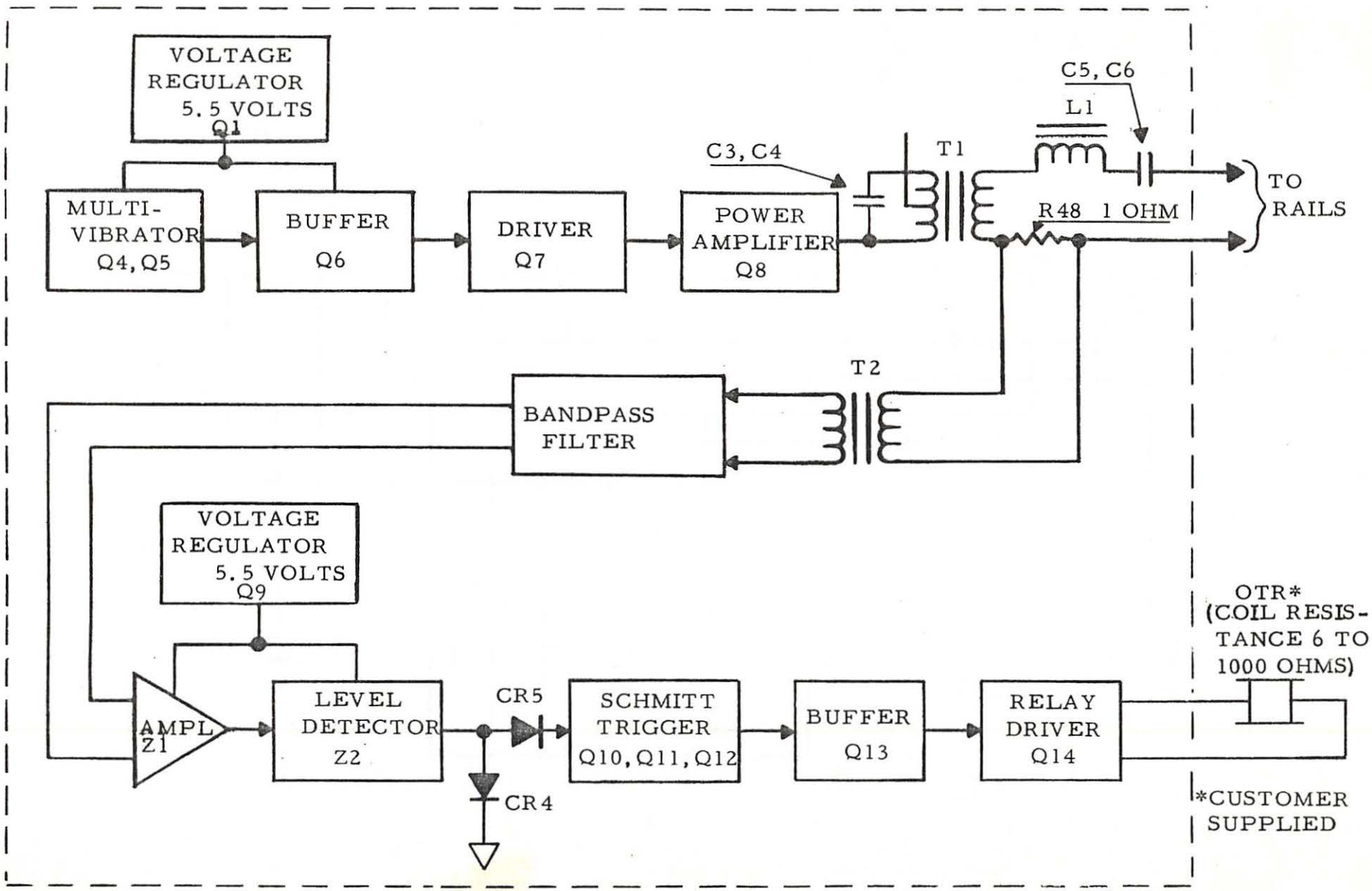


Figure 2. Simplified Block Diagram of Overlay Track Circuit 7A191

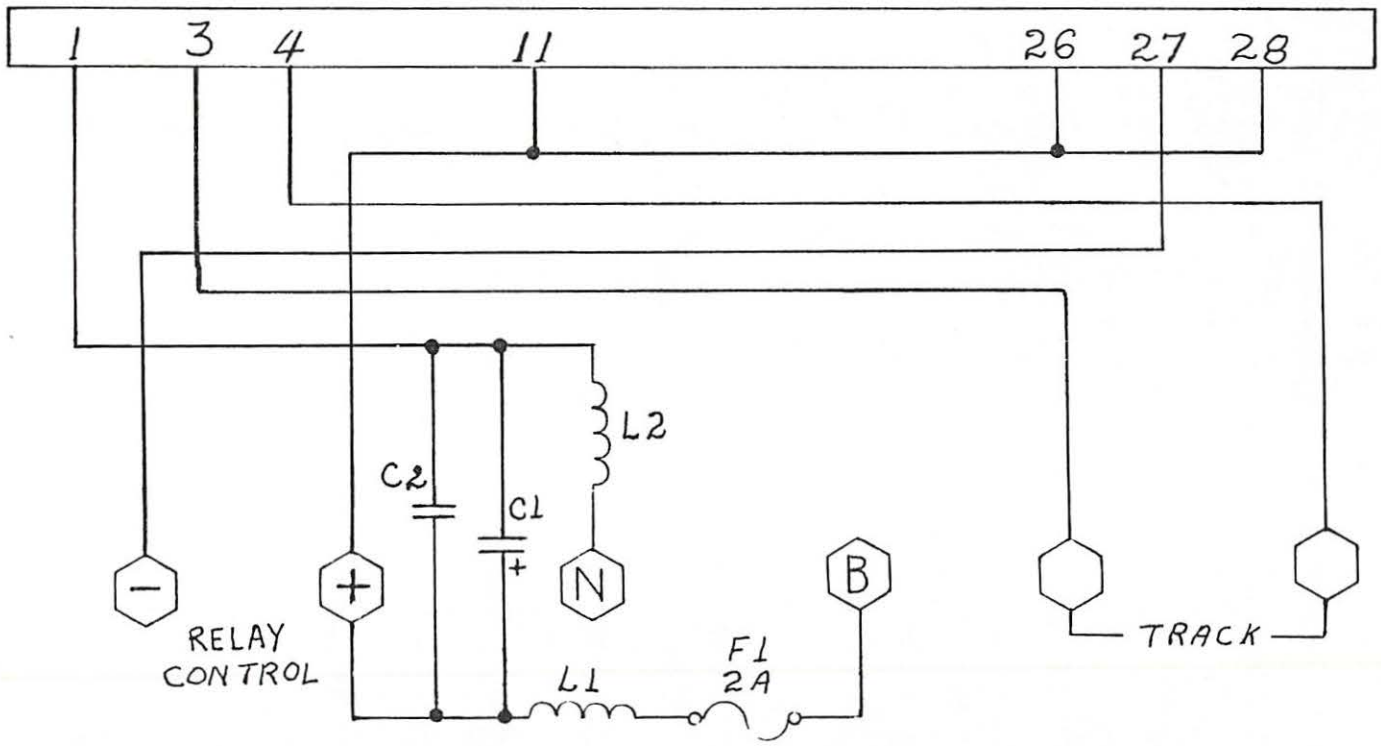


Figure 3. SOTC Wiring Diagram

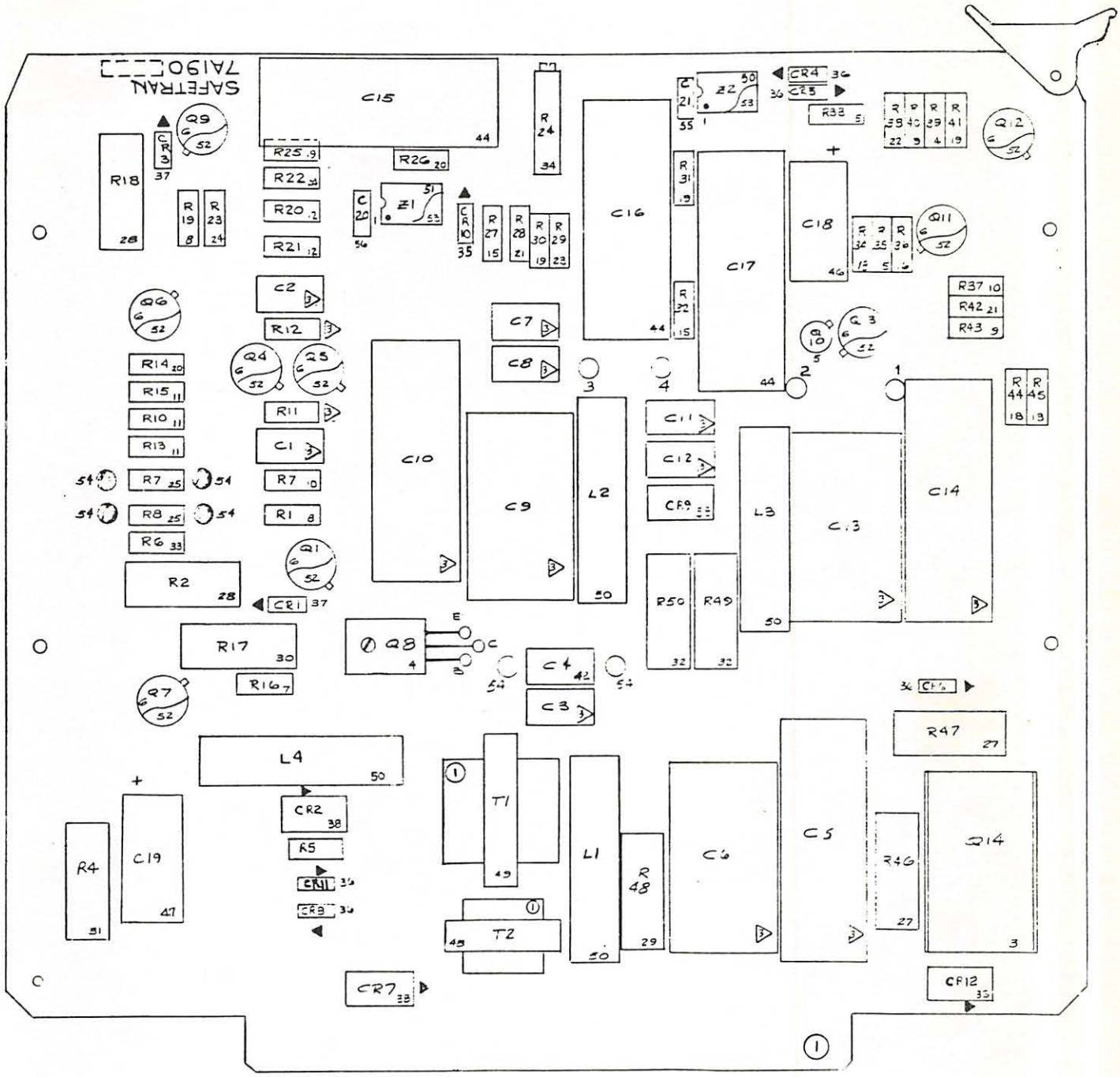
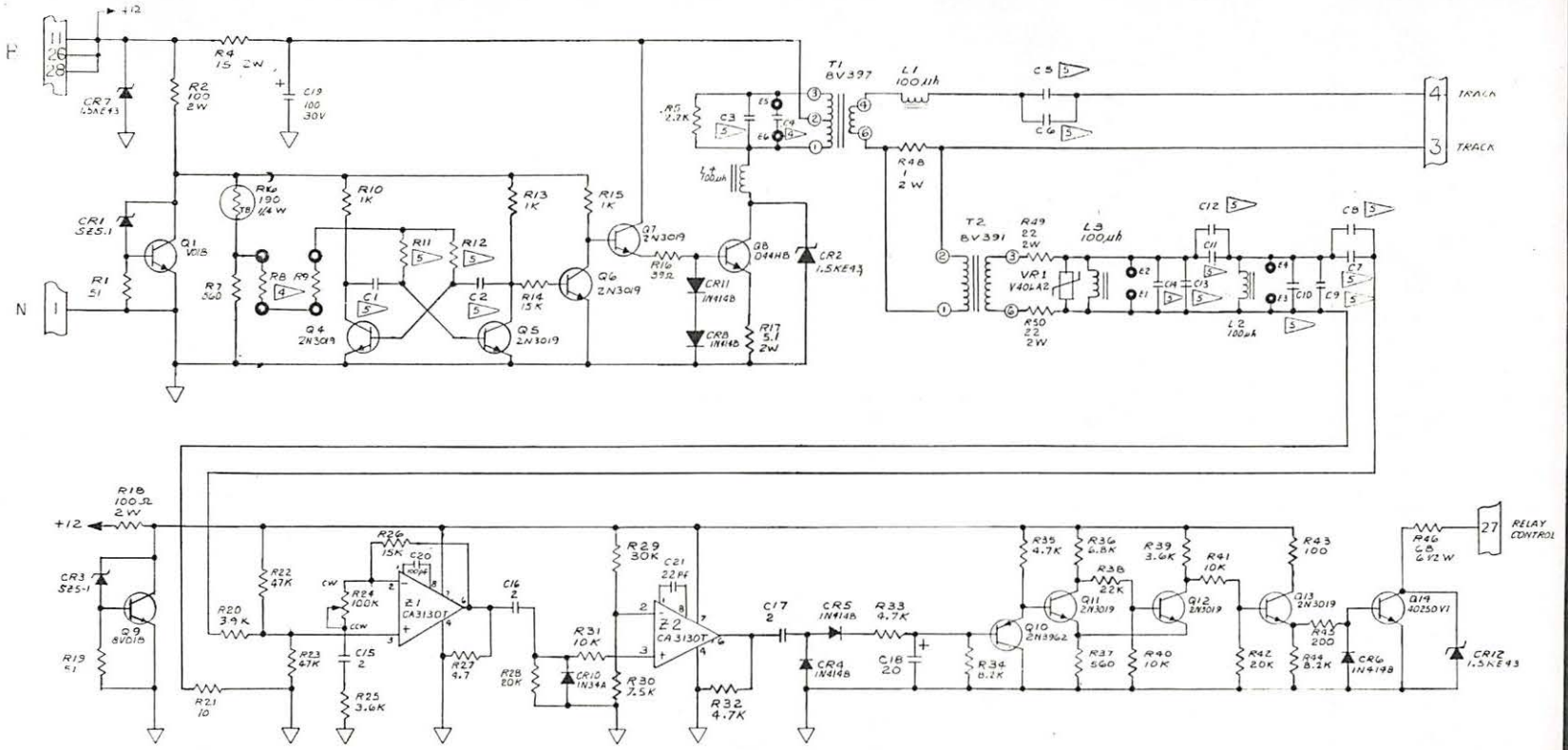


Figure 4. Series Overlay Track Circuit Assembly Diagram 7A190



NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHMS, 1/2W, 5%.
2. ALL CAPACITORS ARE IN µF.
3. LAST REF. DES. USED ARE: C21, CR12, R47, Q14, T2, L2, L3. (NOT USED: R3, R22, R24)

4 VALUE SELECTED AT FINAL MODULE TEST.

5

FREQ.	C1, C2	C3, C7, L11	C5, 10, 14	C8, C12	C9, C13, C4	R11, R12
5900	.00685 µf	.1 µf	3 µf	.047 µf	4 µf	1.5 K
10,000	.0033 µF	.051 µF	2 µF	—	.47 µf	1.5 K

Figure 5. Series Overlay Track Circuit Schematic Diagram 7A190

NEW PRODUCT BULLETIN

HAWKER SIDDELEY

Safetran Systems

4650 Main Street N.E., Minneapolis, MN 55421 • 612-572-0466 • TWX: 629-13307

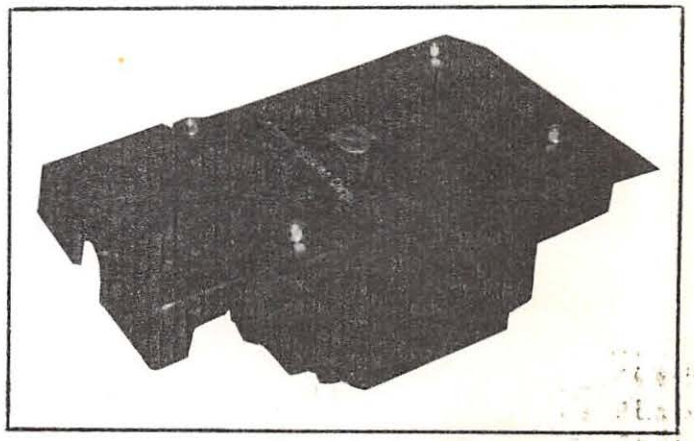
SUBJECT: Model SZB-22 Impedance Bond
2500 Amp, Petro Cooled

NO: 4-84

CATALOG SECTION: Signal

DATE: 4/23/85
rev. 2/5/87

Safetran's Model SZB-22 Impedance Bond is designed to permit propulsion current to bypass insulated joints while providing operation and isolation of adjacent signaling track circuits. Safetran's impedance bonds meet or exceed all applicable AAR specifications.



The Model SZB-22 features a two-piece tape wound C-core which exceeds the magnetic characteristics of conventional laminated transformer cores; thereby reducing size and weight.

The core is fitted with 2 copper coils constructed from large cross sectional area flat copper strips. The complete coil/core assembly is then immersed into an environmentally-safe petroleum conpound for moisture exclusion and cooling.

It is solidly mounted and sealed within a cast iron tub. The cover is ramped to minimize the danger of damage from dragging equipment.

Every impedance bond by Safetran is tested at full-rated current prior to shipment.

Specifications:

Rating: 2500 Amperes/rail - 2 hours
4000 Amperes/rail - .5 hours

Correspondingly higher currents for shorter periods of time.

Inductance: .50 mH rail to rail

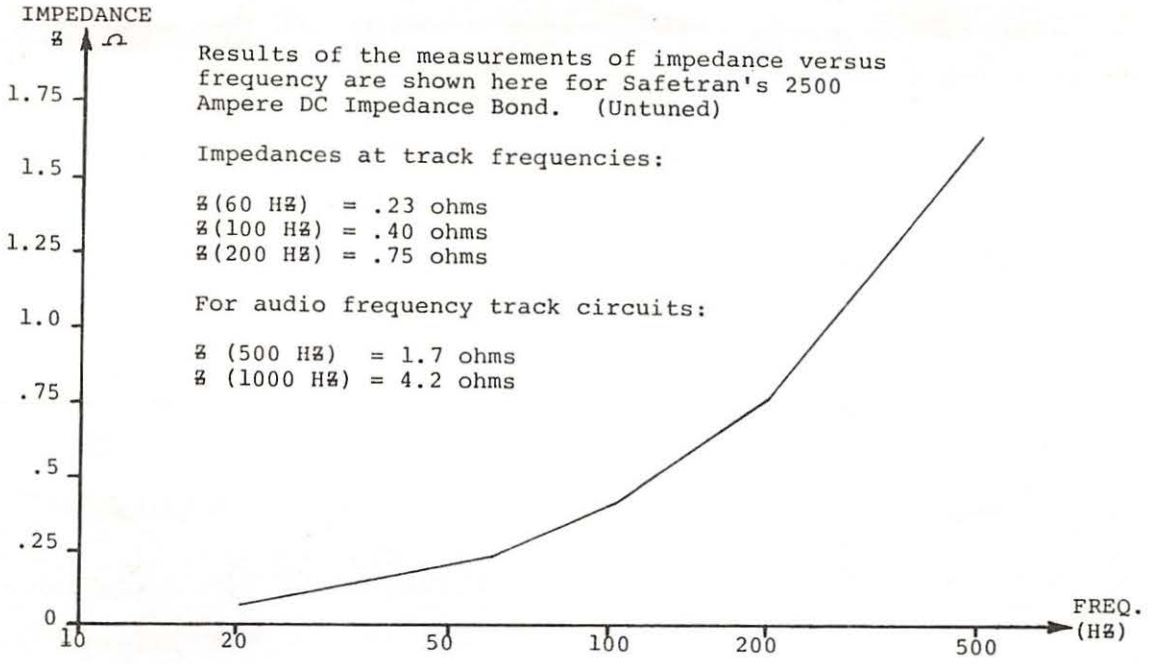
Resistance: 0.000215 Ohms rail to rail

Air Gap: .085"

Case Construction: Cast Iron

Size: Length - 38-3/8"; Width - 23-7/8"; Depth - 14-13/16"

Weight: 840 lbs. per unit



TUNING ARRANGEMENTS

Tuning arrangements are also available which will give higher impedances at selected frequencies. (No more than two frequencies.)

UNBALANCE

In ideal conditions, the traction return current flows equally in both rails and each half of the bond. If under traction fault conditions 'out of balance' occurs the airgap prevents the core from saturating. The bond will accept up to 12 percent unbalance without affecting impedance.

INSULATION TEST

All windings withstand an insulation test of 2000 volts AC for 1 minute between all parts of electrical circuits and other metallic parts.

TEMPERATURE RISE

After full load current (5000 amps) was impressed through the bond for 2 hours the temperature rise was measured to be 153 degrees F. AAR allows 162 degrees F temperature rise. Safetran's bond can handle 2500 amperes/rail continuously and higher currents intermittently.

ORDERING REFERENCE

To Order, Specify Safetran Model SZB-22 Impedance Bond.
If tuning is required, specify tuning frequency.

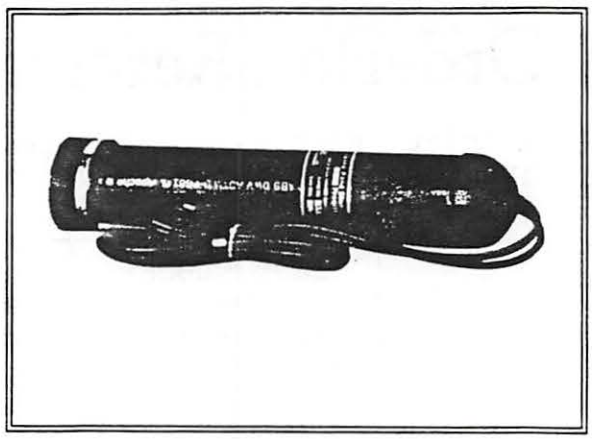
NEW PRODUCT BULLETIN

HAWKER SIDDELEY
Safetran Systems

4650 Main Street N.E., Minneapolis, MN 55421 • 612-572-0466 • TWX: 629-13307

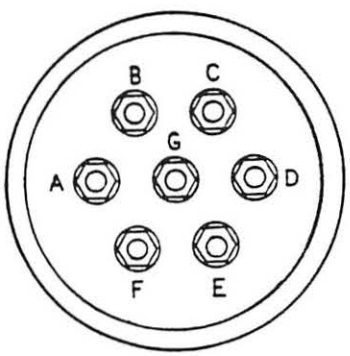
SUBJECT: **Multi-frequency Narrow-band Shunt, 62775** NO: **11-89**

CATALOG SECTION: **Signals** DATE: **12-7-89**



Safetran has added a new multi-frequency shunt to its low-impedance, single-frequency, 62775-f Narrow-band Shunt family. The Multi-frequency Narrow-band Shunt is designed for use with all Safetran Motion Sensors, as well as Model 600, 660, and and 3000 GCPs. However, the shunt is not recommended for use at any location within a Model 300 or 400 GCP approach. Use of the higher impedance, Narrow-band Shunt, 62780, is recommended for these applications. The new shunt is available in three frequency ranges for terminating all standard Safetran equipment operating frequencies. While slightly larger than its single-frequency counterpart, the Multi-frequency Shunt exhibits the same electrical characteristics as the basic single-frequency unit.

The Multi-frequency Narrow-band Shunt is housed in a hermetically-sealed, cylindrical case with a pair of 10-foot leads extending from one end and seven standard AAR terminals extending from the other. The terminals are labeled A through G and are jumpered to select the desired shunting frequency. Terminal jumper hardware is supplied with each shunt and a label located inside the removable end cap identifies the terminal jumpering for each frequency. The pliable end cap covering the terminal end of the shunt is secured in place by a sturdy stainless steel clamp for protection against moisture. The shunt should be connected as close as possible to the rails, but no further away than the existing leads will permit. Although it is not necessary to bury the shunt below the frost line, it should be buried (either vertically or horizontally) at least 18 inches below the surface to afford maximum protection from physical damage.



Specifications:

Dimensions	22 inches (55.9 centimeters) long; 5 inches (12.7 centimeters) in diameter
Weight	10 pounds (4.54 kilograms) (approximate)
Frequencies (Hz)	86, 114, 156, 211, 285, 348, 430, 525, 645, 790, and 970
Leads	10 feet (304.8 centimeters); number 6 AWG, stranded, black PVC

Ordering References:

To order, specify: Multi-frequency Narrow-band Shunt plus the applicable part number below:

Part Number	Programmable Frequencies (Hz)
62775-8621	86, 114, 156, and 211
62775-1543	156, 211, 285, 348, and 430
62775-3497	348, 430, 525, 645, 790, and 970

To order a Single-frequency Narrow-band Shunt, specify part number 62775 plus the applicable frequency below:

Fixed Frequencies (Hz)			
86	211	452	753
100	267	522	790
114	285	525	816
151	326	560	881
156	348	630	970
172	392	645	979
210	430	686	

NEW PRODUCT BULLETIN

HAWKER SIDDELEY
Safetran Systems

4650 Main Street N.E., Minneapolis, MN 55421 • 612-572-0466 • TWX: 629-13307

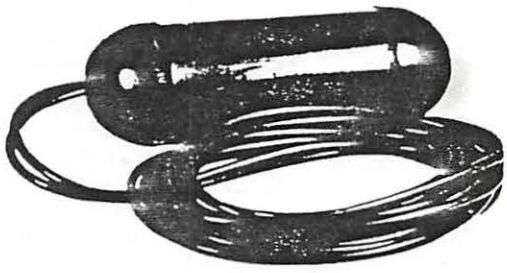
SUBJECT: **Narrow-band Shunt, 62780**

NO: **12-89**

CATALOG SECTION: **Signals**

DATE **12-7-89**

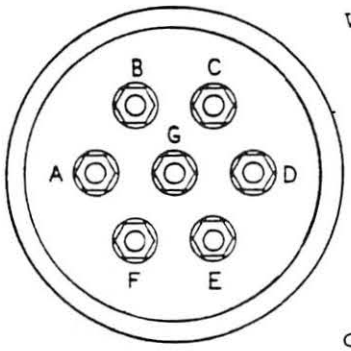
While Safetran's 62775 Narrow-band Shunt remains the primary choice for both unidirectional and bidirectional Motion Sensor (MS) and Grade Crossing Predictor (GCP) applications, the shunt has certain inherent limitations such as a higher loading effect on adjacent MS/GCP frequencies, and it cannot be used where approaches overlap existing Model 300 or 400 GCP approaches. Safetran has now added the 62780 Single-frequency and Multi-frequency Narrow-band Shunt which produces less loading effects on adjacent frequencies, and it can be used in territories with overlapping Model 300 and 400 GCP approaches. The 62780 Shunt is compatible with all Safetran Motion Sensors and GCPs. The 62780 Narrow-band Shunt is available as a single-frequency shunt covering any of 27 frequencies ranging from 86 to 979 Hz or in three multi-frequency versions for terminating all 11 standard Safetran equipment operating frequencies. The multi-frequency shunt is slightly larger than the single-frequency version; however, both units exhibit identical electrical characteristics.



Single-frequency Shunt

Multi-frequency Shunt

Both configurations of the 62780 Narrow-band Shunt are housed in hermetically-sealed, cylindrical cases with a pair of 10-foot leads extending from one end. The Multi-frequency model is also equipped with seven standard AAR terminals which extend from the opposite end of the case. The terminals are labeled A through G and are jumpered to select the desired shunting frequency. Terminal jumper hardware is supplied with each multi-frequency shunt and a label located inside the removable end cap identifies the terminal jumpering for each frequency. The pliable end cap covering the terminal end of the shunt is secured in place by a sturdy stainless steel clamp for protection against moisture. The shunt should be connected as close as possible to the rails, but no



Single-frequency Narrow-band Shunt:

Part Number	Plus Frequency (Hz) (Specify One)
62780	86, 100, 114, 151, 156, 172, 210, 211, 267, 285, 326, 348, 392, 430, 452, 522, 525, 560, 630, 645, 686, 753, 790, 816, 881, 970, or 979

Multi-frequency Narrow-band Shunt:

Part Number	Programmable Frequencies (Hz)
62780-8621	86, 114, 156, and 211
62780-1543	156, 211, 285, 348, and 430
62780-5297	525, 645, 790, and 970

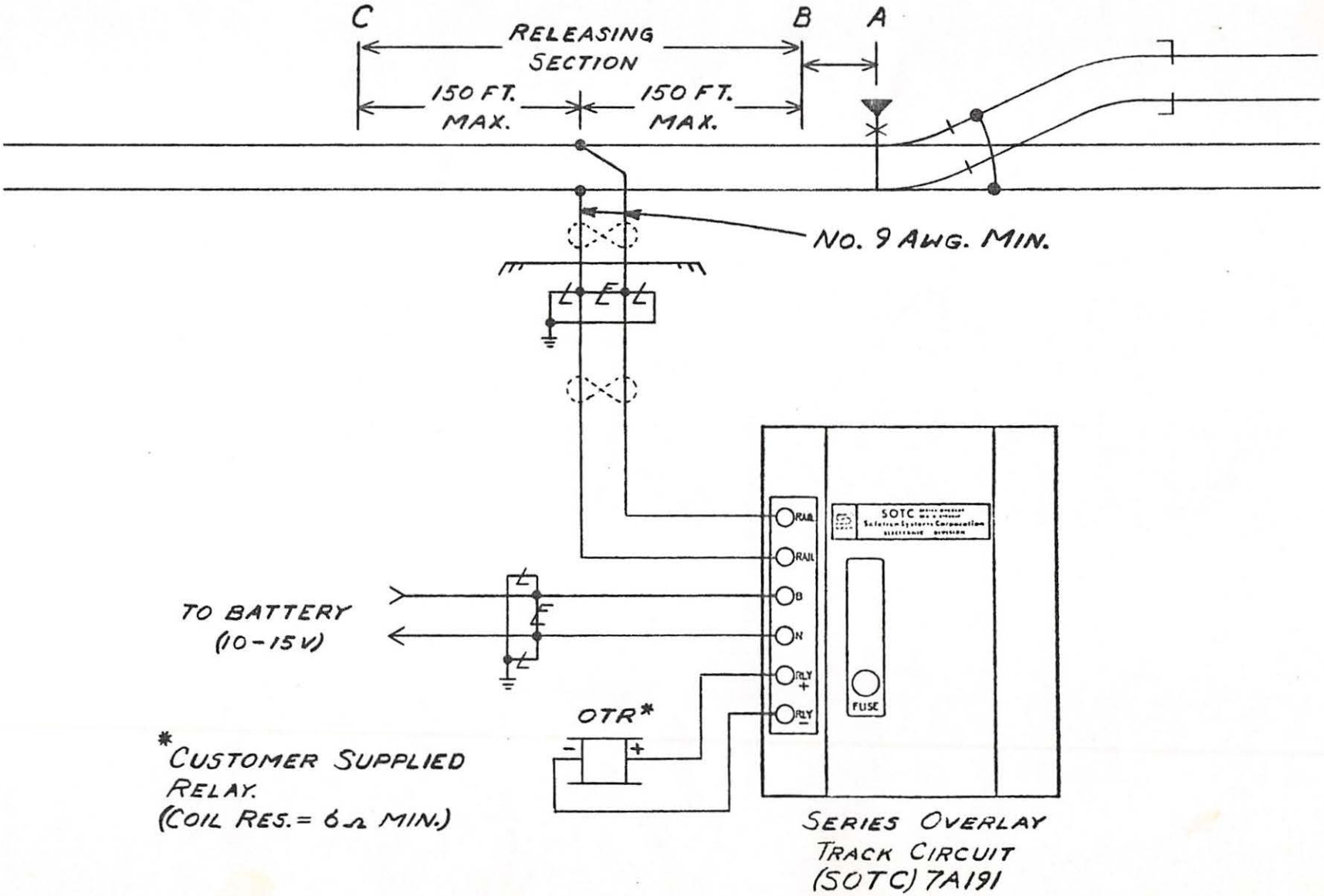


Figure 1. Typical SOTC Installation Plan

Safetran

MOTION SENSOR

MODEL 2000

- Available in both nonredundant and redundant systems
  - Nonredundant system provides two track, independent T1/T2 frequency operation
  - Redundant system provides single-track operation
- Poor shunting software is standard
- Except for the processor module, uses all standard 3000 GCP modules
- Programmable frequencies
- Fully automated calibration
- Programmable remote start operation
- Front panel UAX and Enable inputs
- Front panel terminals accommodate both four- and six-wire operation

Non-Redundant Model 2000 Motion Sensor
Part Number 80080

Using the technological foundation of Safetran's Model 3000 Grade Crossing Predictor, the Model 2000 Motion Sensor offers circuitry and software proven in over a decade of service experience.

The Model 2000 Motion Sensor is available in two configurations: a nonredundant system (part number 80080) and a redundant system (part number 80090). The nonredundant system is designed for two-track installations and provides independent programming of transmit frequencies for track 1 and track 2. The redundant system is designed for use in single-track installations. The transmit frequencies for both systems are field programmable. By using an external automatic transfer timer unit (80024), two nonredundant units can also operate as a redundant system.

Both Model 2000 Motion Sensor units are equipped with Safetran's poor shunting detection software to ensure proper crossing operation in the event of a reduction in train traffic, or the rails become coated with a thin layer of rust.

With the exception of the processor module, the Model 2000 Motion Sensor uses all standard Model 3000 GCP modules. The Model 2000 Motion Sensor is equipped with a new 80224 processor module. Programming is greatly simplified and system calibration requires performing only a single automated setup procedure. The Model 2000 Motion Sensor is also programmable to operate from a remote location. Both the Enable and UAX input terminals are available for more complex applications. Remote six track wire operation is also available via front panel AAR terminals.

SPECIFICATIONS

Input:	
Voltage	9.0-16.5 VDC; 12 VDC nominal
Current	Single-track system - 1.50 amps Two-track system - 2.3 amps Optional modules up to 0.65 amp each Maximum current – 2.95 amps
Transmitter Output Current	250 mA nominal on medium power; up to 500 mA on high power; varies with frequency
Program Selection	Keystroke entry via keyboard/display - Program is displayed by LCD readout
Frequencies Available	Frequencies can be programmed between 45 and 999 Hz in 1 Hz increments. Independent frequencies can be programmed for track 1 and track 2 (Model 2000 only).
Frequency Stability	±0.01 percent
Island Frequencies Available	4.0, 4.9, 5.9, 7.1, 8.3, 10.0, 11.5, 13.2, 15.2, 17.5, or 20.2 kHz (fixed - determined by individual Island Modules, 80011/-80211). In addition to the 11 frequencies listed above, the 80211 island module also provides 2.14, 2.53, and 3.24 kHz.
Island Circuit Length	Determined by island track wire connections - 120 feet (36 meters) minimum to 350 feet (106 meters) maximum
Relay Drive Outputs	400 to 1,000-ohm load
Surge Protection	Built-in surge protection for track and battery connections. Requires only primary arresters and equalizers.
Diagnostics and Monitoring	Accomplished via two-line, 16-character, alphanumeric, liquid crystal display. Diagnostic information, application programming and train move data plus internal voltages are displayed.
Mounting	The 2000 MS can be wall, rack, or shelf mounted. All track, power, and slaving connections use standard AAR terminals.
Dimensions	**Model 2000 and 2000S2**: 23 inches (58.4 cm) wide 11.34 inches (28.8 cm) deep 14.36 inches (36.5 cm) high
Weight	**Model 2000** (all modules in place) 22 pounds (9.9 kg) (approximate) **Model 2000S2** (all modules in place) 30 pounds (13.6 kg) (approximate)
Temperature Range	-40° F to +160° F (-40° C to 71° C)
Operating Distance	Tables 1 and 2 indicate minimum and maximum bidirectional and unidirectional approach lengths, respectively, for each standard Safetran 2000 MS operating frequency with ballast resistances of 2, 4, and 6 ohms per 1,000 feet. Maximum operating distances for any given frequency are governed by ballast resistance conditions, increasing with higher ballast and decreasing with lower ballast. Minimum approach distances are determined by available system gain. The minimum approach distance figures indicate the shortest approach distance over which a given frequency will operate.

Table 1

Ballast Resistance vs. Approach Length by Frequency, Bidirectional Applications

2000 MS Operating Frequency (Hz)	Bidirectional Approach Length (Feet)					
	2 Ohms/1,000 Feet Distributed Ballast		4 Ohms/1,000 Feet Distributed Ballast		6 Ohms/1,000 Feet Distributed Ballast	
	Minimum *	Maximum	Minimum *	Maximum	Minimum *	Maximum
86	1000	5100	1000	7600	1000	9280
114	750	4300	750	6100	750	7448
156	600	3750	600	5200	600	6349
211	475	3200	475	4500	475	5494
285	400	2800	400	3900	400	4762
348	400	2500	400	3400	400	4151
430	400	2200	400	3100	400	3785
525	400	2050	400	2900	400	3541
645	400	1850	400	2600	400	3175
790	400	1650	400	2300	400	2808
970	400	1475	400	2025	400	2472

*Based on use of hardwire or wideband shunts

Table 2

Ballast Resistance vs. Approach Length by Frequency, Unidirectional Applications

2000 MS Operating Frequency (Hz)	Unidirectional Approach Length (Feet)					
	2 Ohms/1,000 Feet Distributed Ballast		4 Ohms/1,000 Feet Distributed Ballast		6 Ohms/1,000 Feet Distributed Ballast	
	Minimum *	Maximum	Minimum *	Maximum	Minimum *	Maximum
86	700	4200	700	5900	700	7080
114	525	3700	525	5300	525	6360
156	420	3200	420	4600	420	5520
211	400	2650	400	3900	400	4680
285	400	2150	400	3300	400	3960
348	400	1850	400	2850	400	3420
430	400	1650	400	2500	400	3000
525	400	1450	400	2150	400	2580
645	400	1250	400	1850	400	2220
790	400	1075	400	1550	400	1860
970	400	1000	400	1425	400	1710

*Based on use of hardwire or wideband shunts

ORDERING INFORMATION

Model 2000 Micro Motion Sensor, Two-Track Unit

Description	Part Number	Description	Part Number
Single Track System *	80080-001	-001 System w/keyboard (1)	80080-005
		-002 System w/keyboard (1)	80080-006
		-003 System w/keyboard (1)	80080-007
		-004 System w/keyboard (1)	80080-008
Double Track System **	80080-002	-001 System w/80015 Data Recorder (1) ***	80080-003
		-002 System w/80015 Data Recorder (1) ***	80080-004

OP98 - 80080 - 005 with 80012

* Includes 80081 Case (1), 80011 Island (1), 80012 Transceiver (1), 80013 Relay Drive (1), 80224 Processor (1) and 80020 Control Interface (1)

** Includes 80081 Case (1), 80011 Island (2), 80012 Transceiver (2), 80013 Relay Drive, 80224 Processor (1) and 80020 Control Interface (1)

***To record external relay functions, it will be necessary to add an 80025 Recorder Interface unit.

NOTE: Please indicate Island 1 and Island 2 frequencies when ordering.

Model 2000S2 Dual Micro Motion Sensor, Single Track

Description	Part Number	Description	Part Number
Dual Basic System *	80090-001	-001 System w/Data Recorder (2) **	80090-002
		-001 System w/keyboard (1)	80090-003
		-002 System w/keyboard (1) **	80090-004

* Includes 80091 Case (1), 80011 Island (2), 80012 Transceiver (2), 80013 Relay Drive (2), 80224 Processor (2), 80029 Control Interface (1) and 80028 Transfer Module (1)

** To record external relay functions, it will be necessary to add an 80025 Recorder Interface unit.

NOTE: Please indicate Island frequency when ordering.

Safetran

MOTION SENSOR/GRADE CROSSING PREDICTOR

MODELS 660, 660ND and 660ND2

- SINGLE AND DUAL CASE CONFIGURATIONS
- OPTIONAL DOWNSTREAM ADJACENT CROSSING OR PREEMPT CONTROL
- SELF-CHECK SYSTEM
- EASY SET-UP

The Model 660 Motion Sensor/Grade Crossing Predictor (660 MS/GCP) represents a major advance in grade crossing warning system control equipment. The Model 660 includes all the features of the Model 600 as well as downstream adjacent crossing (DAX) control for up to two crossings by selecting the appropriate plug-in printed circuit (PC) module(s).

A simplified SHORT CASE version, the 660ND, is also available which is functionally identical to the standard 660 except that provisions for DAX and preempting, including module positions, are eliminated. A dual case is also available which contains two complete sets of 660 modules (minus DAX and/or preempt modules) plus an automatic transfer module to effect transfer between the normal and standby module sets. The unit can be programmed to permit transfer delay times ranging from 4 to 31 minutes in 1-minute increments. A POR indicator lamp circuit is provided on the dual 660 versions and extinguishes the POR indicator any time a transfer is made from the normal to the standby module set.

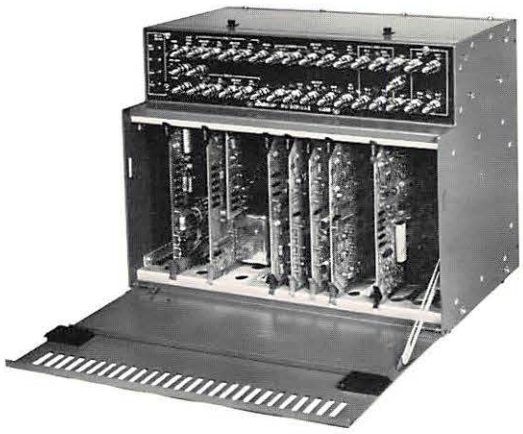
Patented signal processing techniques enable the MS/GCP to operate over long approach circuits under low ballast conditions while providing proper warning time and broken-rail/open-bond protection. Automatic ballast compensation is provided by a patented process which automatically compensates for the "droop" in track input signal caused by low ballast. The unit contains many internal safety check circuits and a self-check system that simulates an approaching train and requires the entire system to respond properly.

Designed with ease of set-up in mind, the prediction zero, DAX prediction zero, and high track drive adjustments have been eliminated. Adjustment of the model 660 MS/GCP generally requires setting of only two potentiometers.

Trouble-shooting of the 660 MS/GCP system is also simplified since each module is equipped with a normally-lighted status indicator (LED). A review of the indicators by the maintainer will rapidly lead to any defective module(s).

The 660ND short case versions are available in low cost, complete packages.

MODEL 660 SPECIFICATIONS



Dimensions:

Standard Case (660)
14-5/8 inches high
10-1/2 inches deep
19 inches wide

Short Case (660ND)

14 inches high
11-1/4 inches deep
22 inches wide

Dual Case (660ND2)

14 inches high
11-1/4 inches deep
38-3/4 inches wide

Weight (All Modules in Place):

Standard Case — 40.5 pounds
Short Case — 25 pounds
Dual Case — 48 pounds

Termperature Range:

-40 °F to +160 °F
(-40 °C to +57 °C)

Island Circuit Length:

Up to 300 feet

Sensitivity (Minimum Detectable Speed):

2 mph or less, depending on approach length

Power Input:

9.5 to 15 VDC, 12 volts nominal
Current-Basic MS System 0.95 Amp
-Basic GCP System 1.05 Amp
Optional modules up to 0.5 Amp (maximum additional)

Transmitter Output:

Normal configuration — 150 mA
High current configuration varies with frequencies up to 500 mA

Motion Sensor Predictor Frequencies (Mf, f):

86, 114, 156, 211, 285, 348, 430, 525, 645, and 790 Hz

Island Frequencies (If):

4.0, 4.9, 5.9, 7.1, 8.3, 10.0, 11.5, 13.2, 15.2, 17.5, 20.2 kHz

ORDERING INFORMATION

MODELS 660/660ND/660ND2

Description	Part Number
Unidirectional Grade Crossing Predictor With Internal Island	62660UP-f
Bidirectional Grade Crossing Predictor With Internal Island	62660BP-f
Motion Sensor With Internal Island	62660MS-f
Special (62660-2) Unidirectional Grade Crossing Predictor With High-frequency Island And One DAX Module	62660UP-2-f-If
Motion Sensor, Short Case (No DAX) With Internal Island	62660NDMS-Mf
Unidirectional Grade Crossing Predictor, Short Case (No DAX) With Internal Island	62660NDUP-Mf
Bidirectional Grade Crossing Predictor, Short Case (No Traffic Preempt) With Internal Island	62660NDBP-Mf
Dual Motion Sensor (No DAX) With Internal Island	62660ND2MS-Mf
Dual Unidirectional Grade Crossing Predictor (No DAX) With Internal Island	62660ND2UP-Mf
Dual Bidirectional Grade Crossing Predictor (No Traffic Preempt) With Internal Island	62660ND2BP-Mf

(Specify frequency — f)

660ND SYSTEMS ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description		Part Number
660ND HW System: Model 660ND Bidirectional Grade Crossing Predictor or Motion Sensor with Internal Island for use in non-signalled territory with no overlapping audio frequencies. (Hard wire shunts)		
Includes:	660ND Grade Crossing Predictor	62660BP-f
or	660ND Motion Sensor	62660MS-f
	Surge Package	022485-72X
660ND HW System with Grade Crossing Predictor		62660NDBP-01-Mf
660ND HW System with Motion Sensor		62660NDMS-01-Mf
660ND WB System: Model 660ND Bidirectional Grade Crossing Predictor or Motion Sensor with Internal Island for use in DC track circuit territory with no overlapping audio frequency track circuits.		
Includes:	660ND Grade Crossing Predictor	62660BP-f
or	660ND Motion Sensor	62660MS-f
	Surge Package	022485-72X
	Two (2) each Wide Band Shunts	8A076A
660ND WB System with Grade Crossing Predictor		62660NDBP-02-Mf
660ND WB System with Motion Sensor		62660NDMS-02-Mf
660ND WBT System: Model 660ND Bidirectional Grade Crossing Predictor or Motion Sensor with Internal Island for use in DC track circuit territory with no overlapping audio frequency track circuits.		
Includes:	660ND Grade Crossing Predictor	62660BP-f
or	660ND Motion Sensor	62660MS-f
	Surge Package	022485-72X
	Two (2) each Terminal Housing	021500-46X
	Two (2) each Wide Band Shunts	8A076A
660ND WBT System with Grade Crossing Predictor		62660NDBP-03-Mf
660ND WBT System with Motion Sensor		62660NDMS-03-Mf

(Specify frequency — f)

Description		Part Number
660ND NB System: Model 660ND Bidirectional Grade Grossing Predictor or Motion Sensor with Island for use with overlapping audio frequency track circuits.		
Includes:	660ND Grade Crossing Predictor	62660BP-f
or	660ND Motion Sensor	62660MS-f
	Surge Package	02248-22X
	Two (2) each Narrow Band Shunt	62775-f
660ND NB System with Grade Crossing Predictor		62660NDBP-04-Mf
660ND NB System with Motion Sensor		62660NDMS-04-Mf
660ND NBT System: Model 660ND Bidirectional Grade Crossing Predictor or Motion Sensor with Island for use with overlapping audio frequency track circuits.		
Includes:	660ND Grade Crossing Predictor	62660BP-f
or	660ND Motion Sensor	62660MS-f
	Surge Package	022485-72X
	Terminal Housing	021500-46X
	Two (2) each Narrow Band Shunts	62775-f
660ND NBT System with Grade Crossing Predictor		62660NDBP-05-Mf
660ND NBT System with Motion Sensor		62660NDMS-05-Mf
660ND2 HW System: Dual 660ND Bidirectional Grade Crossing Predictor or Motion Sensor with Island for use in non-signalled territory with no overlapping audio frequencies. (Hard wire shunts)		
Includes:	660ND2 Grade Crossing Predictor	62660BP-f
or	660ND2 Motion Sensor	62660MS-f
	Surge Package	022485-72X
62660ND2 HW System with Grade Crossing Predictor		62660ND2BP-01-Mf
62660ND2 HW System with Motion Sensor		62660ND2MS-01-Mf
660ND2 WB System: Dual 660ND Bidirectional Grade Crossing Predictor or Motion Sensor with Island for use in DC track circuit territory with no overlapping audio frequency track circuits.		
Includes:	660ND2 Grade Crossing Predictor	62660BP-f
or	660ND2 Motion Sensor	62660MS-f
	Surge Package	022485-72X
	Two (2) each Wide Band Shunts	8A076A
62660ND2 WB System with Grade Crossing Predictor		62660ND2BP-02-Mf
62660ND2 WB System with Motion Sensor		62660ND2MS-02-Mf

(Specify frequency — f)

Description		Part Number
660ND2 WBT System: Dual 660ND Bidirectional Grade Crossing Predictor or Motion Sensor with Island for use in DC track circuit territory with no overlapping audio frequency track circuits.		
Includes:	660ND2 Grade Crossing Predictor	62660BP-f
or	660ND2 Motion Sensor	62660MS-f
	Surge Package	022485-72X
	Two (2) each Terminal Housing	021500-46X
	Two (2) each Wide Band Shunts	8A076A
62660ND2 WBT System with Grade Crossing Predictor		62660ND2BP-03-Mf
62660ND2 WBT System with Motion Sensor		62660ND2MS-03-Mf
660ND2 NB System: Dual 660ND Bidirectional Grade Crossing Predictor or Motion Sensor with Island for use with overlapping audio frequency track circuits.		
Includes:	660ND2 Grade Crossing Predictor	62660BP-f
or	660ND2 Motion Sensor	62660MS-f
	Surge Package	022485-72X
	Two (2) each Narrow Band Shunts	62775-f
62660ND2 NB System with Grade Crossing Predictor		62660ND2BP-04-Mf
62660ND2 NB System with Motion Sensor		62660ND2MS-04-Mf
660ND2 NBT System: Dual 660ND Bidirectional Grade Crossing Predictor or Motion Sensor with Island for use with overlapping audio frequency track circuits.		
Includes:	660ND2 Grade Crossing Predictor	62660BP-f
or	660ND2 Motion Sensor	62660MS-f
	Surge Package	022485-72X
	Two (2) each Terminal Housing	021500-46X
	Two (2) each Narrow Band Shunts	62775-f
62660ND2 NBT System with Grade Crossing Predictor		62660ND2BP-05-Mf
62660ND2 NBT System with Motion Sensor		62660ND2MS-05-Mf

(Specify frequency — f)

660/660ND/660ND2 MS/GCP REPLACEMENT PARTS

Description	Part Number
High Track Drive Coupler Module	62701-f
Transmitter Module	62702
Receiver Module	62703-f
Timing Generator Module	62704
Unidirectional GCP Processor Module	62705
Prediction Module	62706
Self-Check Detector Module	62707
Relay Drive Module	62708
UAX (25 seconds recovery delay)	62709
High-Frequency Island Module	62710-If
DAX-Preempt Prediction Module (maximum of two) P = Preempt, D = DAX	62711-X
Transfer Module (Dual Case only)	62751

(Specify frequency — f)

660/660ND/660ND2 MS/GCP ACCESSORIES

Description	Part Number
Extender Module	62718
Tuned Receiver Filter Assembly	62527-f
Tuned Insulated Joint Bypass Coupler	62531-f
Wide Band Shunt	8A076A
Dual Wide Band Shunt	8A077A
Tunable Narrow Band Shunt	8A275-f
Narrow Band Shunt	62775-f
Automatic Transfer Timer (for Dual MS/GCP operation)	62740

(Specify frequency — f)

Safetran

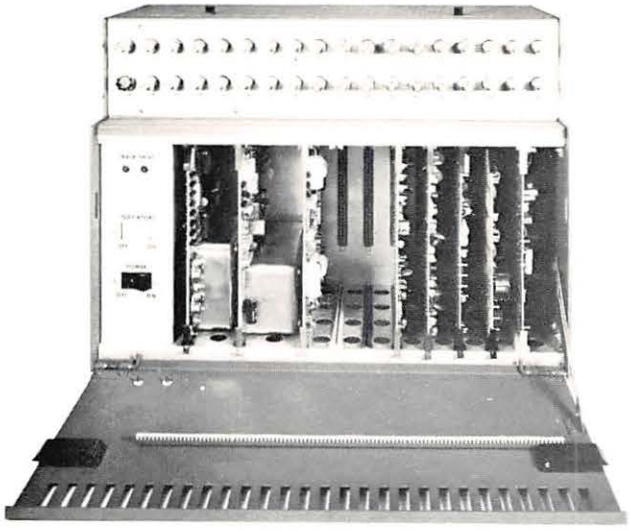
MOTION SENSOR/ GRADE CROSSING PREDICTOR

MODEL 600

- **MOTION SENSITIVE OR CONSTANT WARNING TIME OPERATION**
- **TEN OPERATING FREQUENCIES 86 Hz TO 790 Hz**
- **HIGH POWER TRACK DRIVE CAPABILITY**

Model 600 Motion Sensor/Grade Crossing Predictor (600 MS/GCP) is offered primarily for replacement or for use in territory already using Model 600 Units. It offers the option of motion sensitive or constant warning time operation with one unit. Changing from motion sensing to constant warning time operation is accomplished by replacing one plug-in module and inserting two additional modules. In addition to the motion sensor modules, the Model 600 can accommodate a 62509-f Short Modulated Island Circuit module. Ten operating frequencies (86 Hz to 790 Hz) and eleven island frequencies (4.0 kHz to 20.2 kHz) are offered. Units in the same instrument housing can be frequency slaved to reduce the number of frequencies required.

An adjustable built-in time delay (UAX) circuit is standard equipment on the Model 600. For applications in coded track or high noise environments, high current operation is selected by terminal board connections to a 62618 High-Current Track Drive Transformer. Mounting brackets for shelf or 19 inch rack mounting are available. Built-in surge protection reduces external surge protection requirements to Clearview arresters and Equalizers.



ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Motion Sensor with Modulated Island	62600-Mf-If
Motion Sensor without Modulated Island	62600-Mf-0
Grade Crossing Predictor with Modulated Island	62600P-Mf-If
Grade Crossing Predictor without Modulated Island	62600P-Mf-0

Specify Frequency (Mf, If, f) listed below.

SPECIFICATIONS

Dimensions:
14-5/8 inches high
10 inches deep
19 inches long

Weight:
35 pounds (approximate)

Temperature Range:
-40°F to +160°F
(-40°C to +57°C)

Island Circuit Length:
Up to 300 feet

Sensitivity (Minimum Detectable Speed):
2 MPH or less, depending on approach length

Power Input:
9.5 to 15 VDC
12 Volts nominal
955 mA (with island)

Transmitter Output:
Normal configuration - 150 mA
High Current configuration - varies with frequency up to 750 mA

Motion Sensor Predictor Frequencies (Mf, f):
86, 114, 156, 211, 285, 348, 430, 525, 645, and 790 Hz

Island Frequencies (If):
4.0, 4.9, 5.9, 7.1, 8.3, 10.0, 11.5, 13.2, 15.2, 17.5, and 20.2 kHz

MODEL 600 MS/GCP REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Description	Part Number
Transmitter Module	62651
Receiver Module	62652-Mf
Processor Module	62653
Service Module	62656
Check Module	62657
Motion Predict Module	62658
Relay Drive Module	62659
Modulated Island Module	62509-If
Extractor Module — GCP version — used in place of 62653 Processor Module	62673
Main Integrator Module (GCP)	62674
Backup Integrator Module (GCP)	62675

Specify Frequency (Mf, If, f) listed below.

MODEL 600 MS/GCP ACCESSORIES

Description	Part Number
Extender Module	62616
Tuned Receiver Filter	62527-f
Motion Sensor Test Track Load (2,000 feet equivalent track)	62528-2000
Tuned Coupling Unit (used only for bypassing insulated joints) 156 Hz through 645 Hz	62531-f
Electronic Timer	62679
Terminating Narrow Band Shunt, 86 Hz	62775-86
Terminating Narrow Band Shunt, 114 Hz	62775-114
Terminating Narrow Band Shunt, 156 Hz	62775-156
Terminating Narrow Band Shunt, 211 Hz	62775-211
Terminating Narrow Band Shunt, 285 Hz	62775-285
Terminating Narrow Band Shunt, 348 Hz	62775-348
Terminating Narrow Band Shunt, 430 Hz	62775-430
Terminating Narrow Band Shunt, 525 Hz	62775-525
Terminating Narrow Band Shunt, 645 Hz	62775-645
Terminating Narrow Band Shunt, 790 Hz	62775-790
High Current Transmitter Coupler Assembly	62685-f
High Current Transmitter Coupler Module	62582-f

Frequency (f) must be the sae as the frequency of the Motion Sensor transmitter/receiver.

Frequency of the 62652-Mf Receiver Module and 62685-f High Current Transmitter Coupler Assembly must be the same.

Safetran

MOTION SENSORS

MODELS 590/585

- **STAND-ALONE MOTION SENSING CAPABILITY**
- **AVAILABLE IN SINGLE OR DUAL UNITS**
- **AVAILABLE IN COMPLETE COST-EFFECTIVE PACKAGES**

The Model 590/585 Motion Sensors represent a major advance in motion sensing control equipment. The motion sensors are stand-alone systems producing motion sensitive operation. By adding a single plug-in module, the motion sensors can be operated at a remote location other than a crossing.

The Model 590/585 Motion Sensors are available in low-cost, complete packages. The Model 585 Motion Sensor consists of two Model 590 Motion Sensors housed in a single case with one unit serving as a primary unit and the other as a backup. This provides the capability of switching from one unit to the other in the event of a failure of either unit.

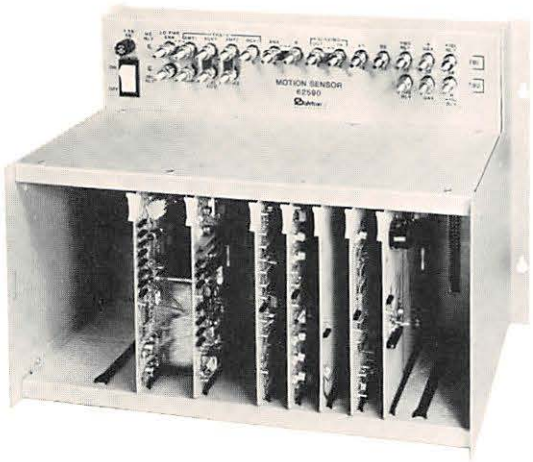
Patented signal processing techniques enable the motion sensors to operate over long approach circuits under low ballast conditions while providing proper warning time and broken-rail/open-bond protection. Automatic ballast compensation is provided by a patented process which automatically compensates for the drop in track input signal caused by low ballast. The unit contains many internal safety check circuits plus a self-check system that simulates an approaching train and requires the entire system to respond properly.

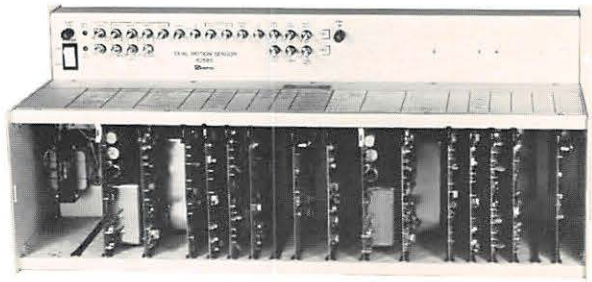
The adjustment procedure for the motion sensor is simple and generally requires only two potentiometer adjustments. Only four wires are required for unit-to-rail connections, and the motion sensor provides for either low-frequency or high-frequency island circuit modules.

A single plug-in module determines the operating frequency of the motion sensor and frequency slaving of two or more motion sensors is easily accomplished by connecting two wires between terminals of the motion sensors. By slaving, two or more motion sensors can share the same frequency.

Fault memory indicators flash when abnormal track conditions cause the high signal detector or divergence detector to display track faults. This provides an indication of track problems which have occurred intermittently.

MODELS 590/585 MOTION SENSOR SPECIFICATIONS





Dimensions:

Model 590:

20-1/2 inches wide
14 inches high
10-1/2 inches deep

Model 585:

33-1/2 inches wide
14 inches high
10-1/2 inches deep

Weight:

Model 590 - 25 pounds
Model 585 - 38 pounds

Temperature Range:

-40° F to +160° F
(-40°C to +57°C)

Island Circuit Length:

Maximum 300 feet

Sensitivity (Minimum Detectable Speed):

2 mph or less depending on approach length

Power Input:

9.5 to 15 VDC, 12 volts nominal
Basic system 0.9 ampere,
optional module up to 0.2 ampere
(maximum) additional

Transmitter Output:

Low current -150 mA
High current up to 500 mA
(maximum) varies with frequency

Motion Sensor Frequencies (Mf):

86, 114, 156, 211, 285, 348, 430
525, 645, 790 Hz

Island Frequencies (If):

4.0, 4.9, 5.9, 7.1, 8.3, 10.0,
11.5, 13.2, 15.2, 17.5, 20.2 kHz

590 MOTION SENSOR PACKAGES ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description		Part Number
590 HW System, Model 590 Motion Sensor for use in non-signalled territory with no overlapping audio frequencies (hard wire shunts)		62590-01-Mf
Includes:	590 Motion Sensor	62590MS-f
	Surge Package	022485-72X
590 WB System, Model 590 Motion Sensor for use in DC track circuit territory with no overlapping audio frequency track circuits		62590-02-Mf
Includes:	590 Motion Sensor	62590MS-f
	Surge Package	022985-72X
	Two Wide Band Shunts	8A076A
590 WBT System, Model 590 Motion Sensor for use in DC track circuit territory with no overlapping audio frequency track circuits		62590-03-Mf
Includes:	590 Motion Sensor	62590MS-f
	Surge Package	022985-72X
	Two Wide Band Shunts	8A076A
	Two Terminal Housings	021500-45X
590 NB System, Model 590 Motion Sensor for use with overlapping audio frequency track circuits		62590-04-Mf
Includes:	590 Motion Sensor	62590MS-f
	Surge Package	022485-72X
	Two Narrow Band shunts	62775-f
590 NBT System, Model 590 Motion Sensor for use with overlapping audio frequency track circuits		62590-05-Mf
Includes:	590 Motion Sensor	62590MS-f
	Surge Package	022485-72X
	Two Narrow Band Shunts	62775-f
	Two Terminal Housings	021500-46X

(Specify frequency — f)

585 DUAL MOTION SENSOR PACKAGES ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description		Part Number
585 HW System, Model 585 Dual Motion Sensor for use in non-signalled territory with no overlapping audio frequencies (hard wire shunts)		62585-01-Mf
Includes:	585 Motion Sensor	62585-Mf
	Surge Package	022485-72X
585 WB System, Model 585 Dual Motion Sensor for use in DC track circuit territory with no overlapping audio frequency track circuits		62585-02-Mf
Includes:	585 Motion Sensor	62585-Mf
	Surge Package	022485-72X
	Two Wide Band Shunts	8A076A
585 WBT System, Model 585 Dual Motion Sensor for use in DC track circuit territory with no overlapping audio frequency track circuits		62585-03-Mf
Includes:	585 Motion Sensor	62585-Mf
	Surge Package	022485-72X
	Two Wide Band Shunts	8A076A
	Two Terminal Housings	021500-45X
585 NB System, Model 585 Dual Motion Sensor for use with overlapping audio frequency track circuits		62585-04-Mf
Includes:	585 Motion Sensor	62585-Mf
	Surge Package	022485-72X
	Two Narrow Band Shunts	62775-f
585 NBT System, Model 585 Dual Motion Sensor for use with overlapping audio frequency track circuits		62585-05-Mf
Includes:	585 Motion Sensor	62585-Mf
	Surge Package	022485-72X
	Two Narrow Band Shunts	62755-f
	Two Terminal Housings	021500-46X

(Specify frequency — f)

ORDERING INFORMATION

590 Motion Sensor With Low-Frequency Island — 62590-Mf
585 Dual Motion Sensor With Low-Frequency Island — 62585-Mf

MODEL 590/585 REPLACEMENT PARTS

Description	Part Number
Low-Frequency Island Module	62589
Transmitter Module	62592
Receiver Module	62593-f
Timing Generator Module	62594
Check Module	62595
Processor Module	62596
Relay Drive Module	62597

MODEL 590/585 ACCESSORIES

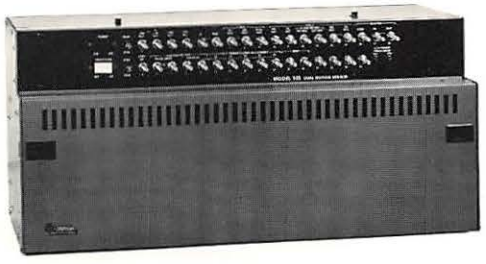
Description	Part No.
Extender Modules	62586 and 62516
Tuned Receiver Filter Assembly	62527-Mf
Tuned Insulated Joint Bypass Coupler	62531-Mf
Dual Wide Band Shunt	8A077A
Tunable Narrow Band Shunt	8A275-f
Narrow Band Shunt	62775-f
Transfer Indicator Board (MS 62585 only)	62574
60 Hz Notch Filter Assembly	62561-60
High-Frequency Island Module	62509-If
High Track Drive Coupler	62591-f
UAX (25-second recovery delay)	62598
Remote Override	62599
Transfer Control Module	62584

(Specify frequency — f)

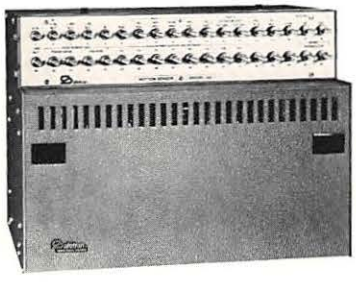
Safetran

MOTION SENSOR

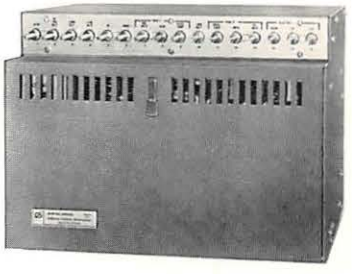
MODELS 550/525/500



525MS



550MS



500MS

The Models 550/525/500 Motion Sensors represent major advances in grade crossing warning system control equipment. Model 550 Motion Sensor (550MS) offers both normal and high power track drive capability with front panel selection in addition to the standard features of the Model 500 Motion Sensor. There is also provision for a plug-in 62582-f High Current Transmitter Coupler Module which replaces the external 8A075-f Narrow Band Shunt for transmitter coupling. These features permit the Model 550 to be readily applied in coded track or other high noise environments. In addition, normalizer operation can be inhibited by strapping terminals on the front panel.

Identical printed circuit modules, other than high current modules, are used in the Model 500, 525 and Model 550 Motion Sensors, so systems can be backed with the same set of spare modules. Ten Motion Sensor frequencies ranging from 86 Hz to 790 Hz are available to accommodate most application requirements. Eleven island frequencies between 4.0 kHz and 20.2 kHz are offered. A selection of broad band and narrow band termination shunts and insulated joint bypass devices are available.

Model 525 Dual Motion Sensor (MS 525) consists of two motion sensors in a single case (a main unit and a standby unit) with the capability of automatically transferring to the standby unit should a failure occur. New signal processing techniques enable the MS 525 to operate over long approach circuits under low ballast conditions while providing proper warning time and broken rail/open bond protection. Automatic ballast compensation is provided by patented compensation circuits.

Model 500 Motion Sensor (500MS) is able to operate over long approach circuits under low ballast conditions while providing safety, proper warning time, and broken rail-open bond protection. Automatic ballast compensation is provided by patented compensation circuits.

ORDERING INFORMATION

MODELS 550/525/500 MOTION SENSORS

To Order: Specify Description and Part Number.

Description	Part Number
Model 550	
Motion Sensor with Modulated Island	62550-Mf-If
Motion Sensor without Modulated Island	62550-Mf-0
Model 525	
Motion Sensor with Modulated Island	62525-Mf-If
Motion Sensor without Modulated Island	62525-Mf-0
Model 500	
Motion Sensor with Modulated Island	62500-Mf-If
Motion Sensor without Modulated Island	62500-Mf-0

Specify Frequency (Mf, If) listed with Specifications

SPECIFICATIONS

MODEL 550 MS

Dimensions:
14-5/8 inches high
10-1/4 inches deep
19 inches long

Weight:
33.4 pounds

Temperature Range:
-40° F to +160°F
(-40°C to +57°C)

Island Circuit Length:
100 to 300 feet

Sensitivity (Minimum Detectable Speed):
2 MPH or less, depending on approach length

Power Input:
9.5 to 15 VDC
12 Volts nominal
950 mA (with island)

Transmitter Output:
Normal configuration - 150 mA
High Current configuration - varies with frequency up to 750 mA

Motion Sensor Frequencies (Mf, f):
86, 114, 156, 211, 285, 348, 430, 525, 645, and 790 Hz

Island Frequencies (If):
4.0, 4.9, 5.9, 7.1, 8.3, 10.0, 11.5, 13.2 15.2, 17.5, and 20.2 kHz

SPECIFICATIONS

MODEL 525 MS

Dimensions:
14-3/8 inches high
10-1/4 inches deep
31 inches long

Weight:
48 pounds

Temperature Range:
-40° F to +160°F
(-40°C to +57°C)

Island Circuit Length:
Maximum 300 feet

Sensitivity (Minimum Detectable Speed):
2 MPH or less, depending on approach length

Power Input:
9.5 to 15 VDC
12 Volts nominal
950 mA

Transmitter Output:
150 mA rms (Low Power Mode)
750 mA rms (High Power Mode)

Motion Sensor Frequencies (Mf):
86, 114, 156, 211, 285, 348, 430, 525, 645, and 790 Hz

Island Frequencies (If):
4, 4.9, 5.9, 7.1, 8.3, 10.1, 11.5, 13.2, 15.2, 17.5, and 20.2 kHz

Transfer Time from Main to Standby Unit:
Adjustable from 4 to 31 minutes for motion sensor failure, 30 seconds for island circuit failure, or immediate transfer when manually controlled.

MODEL 500 MS

Dimensions:
12-5/8 inches high
10-1/4 inches deep
17-1/2 inches long

Weight:
33 pounds

Temperature Range:
-40° F to +160°F
(-40°C to +57°C)

Island Circuit Length:
Maximum 300 feet

Sensitivity (Minimum Detectable Speed):
2 MPH or less, depending on approach length

Power Input:
9.5 to 15 VDC
12 Volts nominal
950 mA (with island)

Transmitter Output:
150 mA rms

Motion Sensor Frequencies (Mf):
86, 114, 156, 211, 285, 348, 430, 525, 645, and 790 Hz

Island Frequencies (If):
4.0, 4.9, 5.9, 7.1, 8.3, 10.0, 11.5, 13.2, 15.2, 17.5 and 20.2 kHz

MODEL 550, 525 AND 500 MOTION SENSOR REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Description	Part Number
Receiver Module	62505-Mf
Transmitter Module	62506
Processor Module	62507
Relay Drive Module	62508
Modulated Island Module	62609-If
Service Module	62543
Check Module	62514
High Current Transmitter Coupler Module	62582-f

Specify Frequency (Mf, If, f) listed on page B-5-2. Frequency of the 62505-f Receiver Module and 62582-f High Current Transmitter Coupler Module must be the same.

Note: The above items are included in the Model 550 MS Units listed on page B-5-2 and should be ordered as replacement parts only.

MODEL 550, 525 AND 500 MOTION SENSOR ACCESSORIES

To Order: Specify Description and Part Number.

Description	Part Number
Extender Module	62616
Tuned Receiver Filter	62527-f
Motion Sensor Test Track Load (2,000 feet equivalent track)	62528-2000
Tuned Coupling Unit (used only for bypassing insulated joints) 156 Hz through 645 Hz	62531-f
Electronic Timer	62679
Terminating Narrow Band Shunt, 86 Hz	62775-86
Terminating Narrow Band Shunt, 114 Hz	62775-114
Terminating Narrow Band Shunt, 156 Hz	62775-156
Terminating Narrow Band Shunt, 211 Hz	62775-211
Terminating Narrow Band Shunt, 285 Hz	62775-285
Terminating Narrow Band Shunt, 348 Hz	62775-348
Terminating Narrow Band Shunt, 430 Hz	62775-430
Terminating Narrow Band Shunt, 525 Hz	62775-525
Terminating Narrow Band Shunt, 645 Hz	62775-645
Terminating Narrow Band Shunt, 790 Hz	62775-790
High Current Transmitter Coupler Assembly	62685-f
High Current Transmitter Coupler Module	62582-f

Frequency (f) must be the same as the frequency of the Motion Sensor transmitter/receiver. Specify delay time (t): 10, 20, 30, 40, 50, 60, 90, 120, or 180 seconds.

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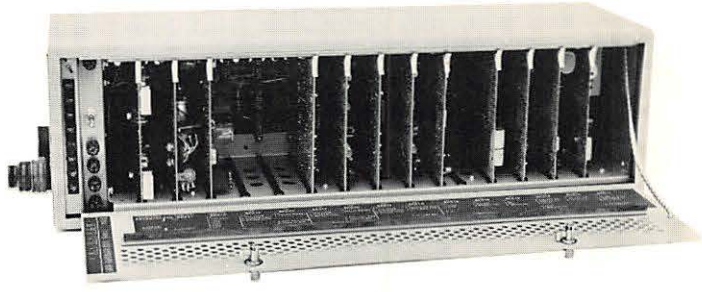
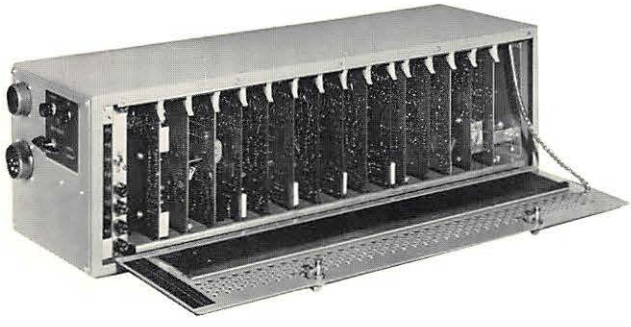
GRADE CROSSING PREDICTORS

MODELS 400/300



Model 300



Model 400

Model 400 and Model 300 Grade Crossing Predictor are designed for crossing warning control where varying train speeds and frequent switching moves are experienced and/or where unnecessary crossing warning operation is undesirable.

These units are no longer in regular production. However, replacement parts and accessories are available.

MODEL 400 GRADE CROSSING PREDICTOR REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Description	Part Number
Power Amplifier Module	8A410
Frequency Module	8A412-f
AC Amplifier and Quadrature Detector Module	8A413
EDX Amplifier and Minimum Distance Detector Module	8A414
Differentiator Module	8A415
Predictor Module *	8A416
Self-Check Detector Module	8A417
Self-Check Generator Module	8A418
Low Signal Detector Module **	8A419
DC to DC Converter Module	8A420/6A340
Component Module	8A421
DAX Predictor Module *	8A436

Specify Frequency (f): 26.5, 37, 86, 114, 156, 211, 285, 348, 430, 525, and 645 Hz.

*Specify warning time (30, 35, 40, 45, 50, 60, or 70 seconds)
**Specify 0.2 second or 5.0 second dropout delay. (This module must be ordered separately.)

MODEL 400 AND 300 GRADE CROSSING PREDICTOR UPSTREAM ADJACENT CROSSING (UAX) KITS

To Order: Specify Description, Time Delay, and Part Number.

Description	Time Delay In Seconds	Part Number
UAX Kit	180	8K001-180
UAX Kit	120	8K001-120
UAX Kit	90	8K001-90
UAX Kit	60	8K001-60
UAX Kit	50	8K001-50
UAX Kit	40	8K001-40
UAX Kit	30	8K001-30
UAX Kit	20	8K001-20
UAX Kit	10	8K001-10
UAX Kit	0	8K001-1

MODEL 400 GRADE CROSSING PREDICTOR ACCESSORIES

To Order: Specify Description, Frequency, and Part Number.

Description	Frequency In Hertz	Part Number
Battery Choke	—	8A065A
Narrow Band Shunt	26.5	8A075-26.5
Narrow Band Shunt	37	8A075-37
Narrow Band Shunt	86	8A075-86
Narrow Band Shunt	114	8A075-114
Narrow Band Shunt	156	8A075-156
Narrow Band Shunt	211	8A075-211
Narrow Band Shunt	285	8A075-285
Narrow Band Shunt	348	8A075-348
Narrow Band Shunt	430	8A075-430
Narrow Band Shunt	525	8A075-525
Narrow Band Shunt	645	8A075-645
Wide Band Shunt	—	8A076A
Dual Wide Band Shunt	—	8A077A
Adjustable Inductor for simulated track (up to 3100 feet) in 50 foot increments	—	8A398-6
Adjustable Inductor for simulated track from 100 to 6300 feet in 100 foot increments	—	8A398-7
Track Drive Transformer (High Current)	26.5 and 37	8A402-1
Track Drive Transformer (High Current)	86 thru 285	8A402-4
Track Drive Transformer (Low Current)	86 and above	8A405-1
Track Drive Transformer (Low Current)	37	8A405-2
Track Drive Transformer (Low Current)	26.5	8A405-3
Input Cable	—	8A430
DC Code Isolation Unit (For Single Polarity DC Code)	—	8A465-7
DC Code Isolation Unit (For use with Track Code)	—	8A465-8
AC Code Isolation Unit (60 Hz Carrier)	430	8A466-430
AC Code Isolation Unit (60 Hz Carrier)	285	8A466-285
AC Code Isolation Unit (60 Hz Carrier)	156	8A466-156
AC Code Isolation Unit (60 Hz Carrier)	114	8A466-114
AC Code Isolation Unit (60 Hz Carrier)	—	8A466-3
AC Code Isolation Unit (60 Hz Carrier)	37	8A466-37
AC Code Isolation Unit (60 Hz Carrier)	26.5	8A466-26.5
AC Code Isolation Unit (100 Hz Carrier)	430	8A468-430
AC Code Isolation Unit (100 Hz Carrier)	348	8A468-348
AC Code Isolation Unit (100 Hz Carrier)	285	8A468-285
AC Code Isolation Unit (100 Hz Carrier)	—	8A468-1
Transmitter Coupling	37	8A467-37
Transmitter Coupling	26.5	8A467-26.5
Notch Filter	100	8A469-2
Notch Filter	60	8A469-1
LED Indication Lamp	—	5SB-RI2H-CW

*Specify 110 VAC or 220 VAC operation.

MODEL 300 GRADE CROSSING PREDICTOR REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Description	Part Number
Power Amplifier	8A310
Frequency Module 86 Hz	8A312-86
Frequency Module 156 Hz	8A312-156
Frequency Module 285 Hz	8A312-285
Frequency Module 645 Hz	8A312-645
AC Amplifier Module	8A313
Quadrature and Minimum Distance Detector Module	8A314
Differentiator Module	8A315
Predictor Module **	8A316
Self-Check Detector Module	8A317
Self-Check Generator Module	8A318
Low Signal Detector Module *	8A319
Voltage Regulator and DC/DC Converter	8A420/6A340
Component Module	8A321
Test Plug P2 (Dummy Track-Internal Wiring) ***	8A331
DAX Predictor Module **	8A336

*Specify 0.4 second or 5.0 second dropout delay. (This module must be ordered separately.)
**Specify warning time (30, 35, 40, 45, 50, 60, or 70 seconds) and prediction dropout delay (2 or 3 seconds).
***Specify track equivalent footage (0, 100, 200, or 300 feet).

MODEL 300 GRADE CROSSING PREDICTOR ACCESSORIES

To Order: Specify Description, Frequency, and Part Number.

Description	Frequency	Part Number
Battery Choke	—	8A065A
Narrow Band Shunt	645	8A075-645
Narrow Band Shunt	285	8A075-285
Narrow Band Shunt	156	8A075-156
Narrow Band Shunt	86	8A075-86
Wide Band Shunt	—	8A076A
Dual Wide Band Shunt	—	8A077A
Dynamic Prediction Test Unit	—	8A070
Arc Suppressor	—	8A299
Extender Module	—	8A399
Input Cable	—	8A330
Test Plug P2 (External Wiring)***	—	8A337
Test Box J2 (Required for setup and adjustment)	—	8A071
LED Indication Lamp	—	5SB-R12H-CW

***Specify track equivalent footage (0, 100, 200, or 300 feet).

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MOTION SENSORS

MODEL 300/350

Model 300

Model 350

Model 300 and 350 Motion Sensors (300 MS and 350 MS) are electronic motion sensitive devices which activate the railroad crossing warning by responding to the motion of a train moving toward the crossing.

The Motion Sensor incorporates provision for a Short Range Track Circuit (SRTC) or a Medium Range Track Circuit (MRTC) which is an independent audio frequency transmitter/receiver mounted on a single module for an island circuit.

These units are no longer in regular production, however replacement parts and accessories are available.

MODEL 300 AND 350 MOTION SENSOR REPLACEMENT PARTS

To Order: Specify Description and Part Number

Description	Part Number
Power Amplifier Module	6A330
Frequency and Amplifier Module * (Specify Motion Sensor Frequency (Mf) in Hz)	6A332-Mf
LSD, HSD, LGD Module	6A334
Motion Detector Module *	6A335
DC/DC Converter Module	8A420
Component Module	6A341-2
SRTC Module (Specify Island Frequency (If) in kHz)	6A380-If
MRTC Module (Specify Island Frequency (If) in Hz)	6A380-If

Specify frequency (Mf, If) listed on page B-5-2.

*For coded track installations specify 6A332-2-Mf and 6A335-2 modules.

MODEL 300 AND 350 MOTION SENSOR UPSTREAM ADJACENT CROSSING (UAX) KITS

To Order: Specify Description, Time Delay, and Part Number.

Description	Time Delay In Seconds	Part Number
UAX Kit	180	8K001-180
UAX Kit	120	8K001-120
UAX Kit	90	8K001-90
UAX Kit	60	8K001-60
UAX Kit	50	8K001-50
UAX Kit	40	8K001-40
UAX Kit	30	8K001-30
UAX Kit	20	8K001-20
UAX Kit	10	8K001-10
UAX Kit	0	8K001-1

MODEL 300 AND 350 MOTION SENSOR ACCESSORIES

To Order: Specify Description and Part Number.

Description	Part Number
Oscillator Coupling Unit (Used for common oscillator connection of multiple units operating at a common frequency)	6A305
Relay Repeater Assembly	6A306-1
Relay Repeater Assembly (Required for unidirectional installation)	6A306-2
Trailing Move Prediction Override Unit	6A307
DC Coded Track Isolation Unit (Single Polarity Code)	6A342-1
Low Pass Filter (Used with PMTC) fo = 125 Hz	6A348-125
Low Pass Filter (Used with PMTC) fo = 160 Hz	6A348-160
Notch Filter, 60 Hz	6A349-60
Battery Choke	8A065A
Wide Band Shunt	8A076A
Dual Wide Band Shunt	8A077A
Narrow Band Shunt (26.5 Hz)	8A075-26.5
Narrow Band Shunt (37 Hz)	8A075-37
Narrow Band Shunt (86 Hz)	62775-86
Narrow Band Shunt (114 Hz)	62775-114
Narrow Band Shunt (156 Hz)	62775-156
Narrow Band Shunt (211 Hz)	62775-211
Narrow Band Shunt (285 Hz)	62775-285
Narrow Band Shunt (348 Hz)	62775-348
Narrow Band Shunt (430 Hz)	62775-430
Narrow Band Shunt (525 Hz)	62775-525
Narrow Band Shunt (645 Hz)	62775-645
Adjustable Inductor for simulated track (up to 3100 feet) in 50 foot increments	8A398-6
Adjustable Inductor for simulated track from 100 to 6300 feet in 100 foot increments	8A398-7
Arc Suppressor	8A299
Extender Module	8A399
High Current Track Drive Transformer	8A402-4

Safetran

PHASE SHIFT OVERLAY II

7A400

- MODULATED HIGH SECURITY AUDIO OVERLAY TRACK CIRCUIT
- SIXTEEN FREQUENCIES 156 Hz TO 4.0 kHz
- RAIL OR LINE APPLICATION

Phase Shift Overlay II (PSO II) is a modulated, high-security, audio frequency overlay track circuit available in 16 frequencies from 156 Hz to 4.0 kHz suitable for all overlay uses including highway crossing warning system approach circuits, and wrap-around circuits for Motion Sensors and Grade Crossing Predictors. Either transmitter or receiver can be connected through cable to the rail at a point distant from the instrument housing by using couplers designed for this purpose. PSO II circuits can be operated over open line wire or cable for block indication or similar purposes.

Transmitters and receivers are each single plug-in printed circuit modules for ease of maintenance. Surge protection is built in except for primary protection on track, battery and line leads.

A number of accessory items such as battery chokes, insulated joint by-passes, and various rail and rail-to-line couplers are available to deal with most PSO II applications. The 7A408 assembly contains two PSO II receiver modules and an SMTC island circuit for a complete grade crossing control package.

ORDERING INFORMATION

To Order: Specify Part Number.

Frequency Hz	Part Number				
	Assembly		Module		Track Circuit Complete
	Transmitter	Receiver	Transmitter	Receiver	
156	7A400-156	7A405-156	7A411-156	7A416-156	7A444-156
211	7A400-211	7A405-211	7A411-211	7A416-211	7A444-211
285	7A400-285	7A405-285	7A411-285	7A416-285	7A444-285
348	7A400-348	7A405-348	7A411-348	7A416-348	7A444-348
430	7A400-430	7A405-430	7A411-430	7A416-430	7A444-430
525	7A400-525	7A405-525	7A411-525	7A416-525	7A444-525
645	7A400-645	7A405-645	7A411-645	7A416-645	7A444-645
790	7A400-790	7A405-790	7A411-790	7A416-790	7A444-790
970	7A400-970	7A405-970	7A411-970	7A416-970	7A444-970
1180	7A400-1180	7A405-1180	7A411-1180	7A416-1180	7A444-1180
1450	7A400-1450	7A405-1450	7A411-1450	7A416-1450	7A444-1450
1770	7A400-1770	7A405-1770	7A411-1770	7A416-1770	7A444-1770
2140	7A400-2140	7A405-2140	7A411-2140	7A416-2140	7A444-2140
2630	7A400-2630	7A405-2630	7A411-2630	7A416-2630	7A444-2630
3240	7A400-3240	7A405-3240	7A411-3240	7A416-3240	7A444-3240
4000	7A400-4000	7A405-4000	7A411-4000	7A416-4000	7A444-4000

PSO II Track Circuit 7A444-f consists of one 7A400-f Transmitter, one 7A405-f Receiver and one 7A355A-f Tuned Receiver Coupler.

PSO II Crossing System 7A408

Asembly contains two 7A416-f PSO Receiver Modules and one 62509-f* Short Modulated Track Circuit Module. Specify island frequency, east receiver frequency and west receiver frequency.

*See SMTC, 71010, catalog page B-11-2 for frequencies.

SPECIFICATIONS

Dimensions:

7A400, 7A405
- 9-1/4 inches high
- 7-1/2 inches wide
- 8-3/4 inches deep

7A408
- 11 inches high
- 14-1/4 inches wide
- 8-3/4 inches deep

Weight:

7A400, 7A405
- 11 pounds

7A408
- 16 pounds

Temperature Range:

-40° F to +160°F
(-40°C to +57°C)

Frequencies Available (in Hz):

156, 211, 285, 348, 430, 525, 645, 790, 970, 1180, 1450, 1770, 2140, 2630, 3240, 4000

Input Power:

9.5 to 15 VDC
transmitter and receiver

350 mA nominal (transmitter, low power)
600 mA nominal (transmitter, high power)
250 mA nominal (receiver)

Relay Coil Resistance:

250 ohms to 1000 ohms

PHASE SHIFT OVERLAY II ACCESSORIES

To Order: Specify Description, Part Number and Frequency Where Required.

Description	Part Number
PSO Tuned Receiver Coupler	7A355A-f
PSO Battery Choke	7A360
PSO Tuned Receiver Coupler (high impedance)	7A366-f
PSO Tuned Insulated Joint Bypass	7A375-f
PSO Wideband Insulated Joint Bypass	7A376
PSO Rail to Line Coupling Unit	7A377-f
PSO Line Coupler	7A388
PSO Transmitter Line to Rail Coupler	7A399-f

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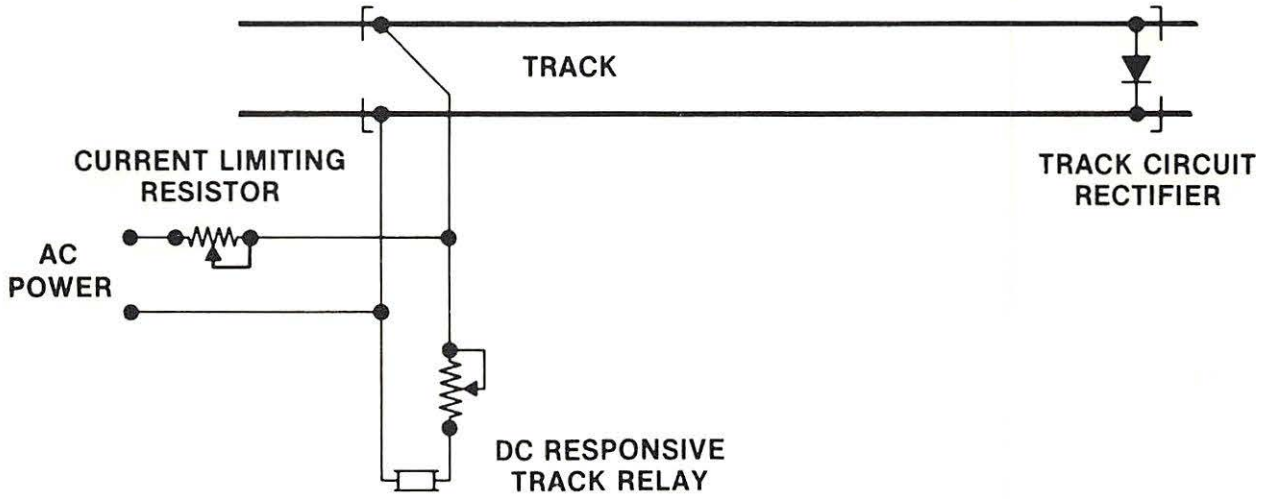
AC/DC TRACK CIRCUIT

TYPE C



- VARIETY OF POWER SUPPLIES AVAILABLE
- ADAPTABLE TO MEET YOUR SPECIFICATIONS
- FIVE DIFFERENT SYSTEMS

Safetran's AC/DC or Type C Track Circuit is a means of train detection in conjunction with grade crossing warning systems. It provides better shunting sensitivity than a conventional DC track circuit, and locates commercial AC power components in a single centralized housing at the crossing.

A standard grade crossing warning system uses three distinct track circuits defined by insulated joints. Two of the circuits detect the approach of a train, while the third detects a train on the island circuit or the crossing itself.

With the Type C Track Circuit, AC is applied across the rails at one end of the circuit and is half-wave rectified to DC at the opposite end. This DC energizes a DC responsive track relay. When the rails are shunted, AC does not reach the rectifier. No DC appears in the circuit and the track relay is de-energized. The track relay will also de-energize for any circuit break, rail break, or short circuit as with a conventional track circuit.

Necessary equipment for the Type C Track Circuit consists of an AC Power Supply, track rectifier, DC responsive track relay, and one or more resistors. Safetran offers several variations of each of these components enabling the customer to adapt a system to his own specifications.

TRACK TRANSFORMER

MODEL 1011-1-30

- THREE SEPARATE SECONDARY OUTPUTS
- OPERATION IS COMPATABLE WITH POWER TRANSFER RELAYS

The Model 1011-1-3 Track Transformer is a 115/230 VAC operation power supply with three independent 6 VAC tapped outputs, each rated at 5.0 amperes.

The track transformer can be used in conjunction with a power transfer relay normally energized by AC power. In the event of commercial AC power failure, the relay will drop out allowing AC from a battery powered inverter to operate the track transformer.

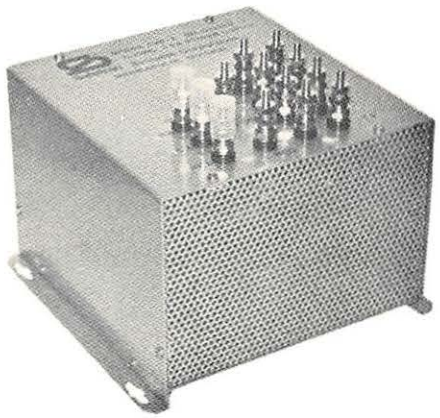
The 1011-1-30 measures 5-1/8 inches high, 7-3/8 inches wide, 8-3/8 inches long, and weighs 9-3/4 pounds.

ORDERING INFORMATION

To Order: Specify Model 1011-1-30 Track Transformer and Part Number 010500-1X.

TRACK CIRCUIT POWER SUPPLY

MODEL CXP-2



- **BUILT-IN SOLID-STATE INVERTER**
- **4 INDEPENDENT SECONDARY OUTPUTS**
- **INPUTS FOR BOTH 115 VAC AND 12 VDC POWER**

The Model CXP-2 Type C Power Supply employs a track feed transformer, power transfer relay, and standby inverter in a single housing. The CXP-2 acts as a track feed transformer when the circuit is operated with 115 VAC power. In the event of AC power interruption, the CXP-2 converts standby battery power to 6.3 VAC through the use of its solid state inverter.

This standby inverter includes power transistors with high inverse voltage breakdown; isolated to avoid accidental grounding of signal battery.

The Model CXP-2 is capable of operating up to 4 track circuits through 4 independent secondary outputs of 6.3 VAC, rated at 3.5 amperes each. Inputs are provided for both 115 VAC commercial power and 12 VDC standby battery power. The Model CXP-2 is the most cost effective method of providing power for a Type C track circuit when standby battery power is required.

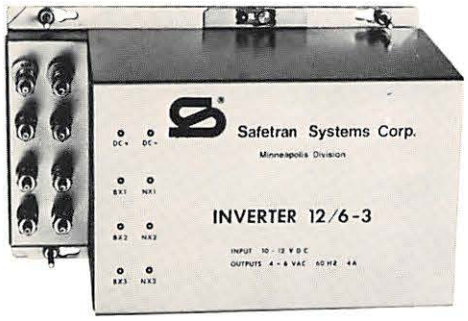
The Model CXP-2 measures 9 inches in height, 9-1/2 inches in width, 7-3/4 inches in depth, and weighs 18 pounds.

ORDERING INFORMATION

To Order: Specify Model CXP-2 Track Circuit Power Supply and Part Number 010350-1X.

DC-AC INVERTER

MODEL 12/6-3



- DESIGNED SPECIFICALLY FOR USE WITH TRACK CIRCUITS
- DIODE AND FILTER PROTECTION TO AVOID COMPONENT DAMAGE
- COMPLETELY SOLID STATE

The Safetran Model 12/6-3 DC-AC Inverter has been designed specifically for use with track circuits employing AC feed and DC track relay at one end and rectifier at the opposite end of the circuit.

It provides three outputs such that all track circuits at a conventional single track highway crossing warning may be supplied from the one unit. Each output will deliver a 6 VAC, 60 Hz from a 12 VDC battery or 5 VAC, 50 Hz from a 10 VDC battery. All outputs may be loaded up to 4 amperes each.

The 12/6-3 is completely solid state. It utilizes only two silicon power transistors with high reverse voltage breakdown. Zener diode and filter protection is incorporated to avoid component damage due to transients and surges.

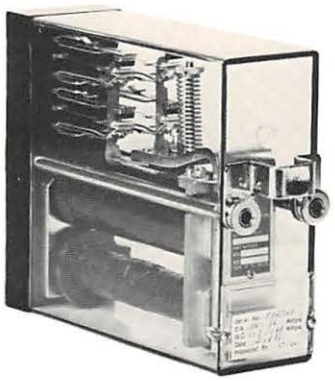
The 12/6-3 DC-AC Inverter can be used as a continuous power supply when connected in parallel with an automatic or float type battery charger. The battery operates the circuit when commercial AC fails. It will prove economical under these circumstances, replacing the feed transformer, power off relay and standby 115 VAC inverter. The 12/6-3 measures 6-1/8 inches in height, 12-1/4 inches in width, 7-1/2 inches in depth, and weighs 14-1/2 pounds.

ORDERING INFORMATION

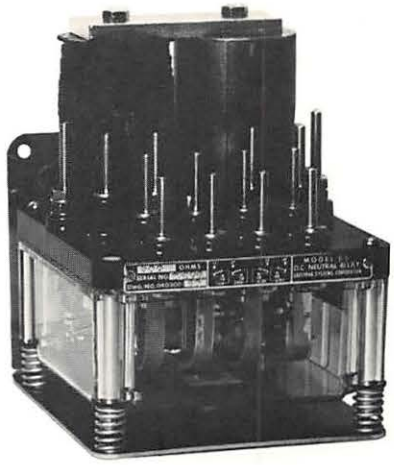
To Order: Specify Model 12/6-3 DC-AC Inverter and Part Number 010218-X.

VITAL NEUTRAL TRACK RELAYS

TYPE ST, MODEL E-5



Type ST Plug-in



Model E-5 Shelf Type

The Type ST is a Plug-in Vital Neutral Relay. It incorporates the required control characteristics as well as operating security for this application. This relay is interchangable with existing types of relays and will mount to common sockets.

This relay has a highly efficient magnetic structure, making routine calibration quick and easy. A heavy armature provides for positive dropaway. A 4 ohm coil resistance relay is normally used with the Type C track circuit. The relay is equipped with either a 4FB-2F-1B or 6FB contact arrangement rated at 4 amps, 30 volts. The normally open or front contacts are fine silver to silver impregnated carbon; normally closed or back contacts are fine silver to fine silver. The relay measures 6-3/8 inches in height, 2-1/2 inches in width, 8-1/2 inches in depth, and weighs 7-1/2 pounds.

The Model E-5 is a Shelf Type Vital Neutral Relay equipped with four dependent, heavy duty front and back contacts. These contacts are rated to carry 10 amperes continuously at 30 volts or less. The coil resistance is 4 ohms. Contact post designations are shown on the nameplate on the front of the relay. The E-5 can be either wall or shelf mounted as desired. With mounting bracket, the E-5 measures 8-1/8 inches in height, 6-1/8 inches in width, 6 inches in depth, and weighs 11 pounds.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Type ST Plug-in Vital Neutral Relay, 4FB-2F-1B Contacts, 4 Ohm	400011
Type ST Plug-in Vital Neutral Relay, 6FB Contacts, 4 Ohm	400010
Model E-5 Shelf Type Vital Neutral Relay, 4FB Contacts, 4 Ohm	040300-26BX

AC-DC TRACK CIRCUIT RECTIFIERS

MODELS TCR-1, -2, -3, -5, -6

TCR-1, -2, -3, -5

TCR-6

- **MOUNTABLE BETWEEN OR BESIDE RAILS**
- **AVALANCE TYPE SILICON DIODES**

Safetran Track Circuit Rectifiers (TCR) are constructed for mounting between or beside rails. Model TCR-1, -2, -3 and -5 are housed in a cast iron box with removable cover so that the rectifier can be replaced. The TCR-6 is a sealed type rectifier serviced as an assembly.

Models TCR-1, -2, -3, when furnished with bootleg pedestal, are 20 inches in height. Sufficient wire is provided for locating anywhere in the crosstie area. Stranpins are provided for connecting to rails and clips are included for fastening of the wire to the tie.

These units use avalance type silicon diodes which abruptly go into reverse conduction when a reverse surge exceeds 400 peak volts. Unlike normal diodes, these can absorb up to 300 watts of surge power. An equalizer and a choke coil assembly are included to absorb surge power beyond this level. Forward current rating is 4 amperes continuous.

Model TCR-2 is furnished with cast iron box suitable for lagging to top of tie. The TCR-3 is furnished with downset plate to allow mounting between ties for the protection against dragging equipment.

The Model TCR-5 is also housed in a cast iron box with downset plate for lagging to ties. A selinium rectifier is used. Even with repetitive excess surge reverse voltage, this rectifier will restore to normal operation several times before failing. For additional rectifier protection, an equalizer and a choke coil assembly are included. Forward current rating is 3 amperes continuous.

The Model TCR-6 is housed in a 1-1/2 inch diameter x 6-1/2 inch long aluminum cylinder with brackets for lagging to tie. The rectifier is an avalance breakdown silicon diode which will withstand 400 peak inverse volts and is protected by a sealed equalizer. Forward current rating is 6 amperes continuous.

AC-DC TRACK CIRCUIT RECTIFIERS ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Model TCR-1 Track Circuit Rectifier	010130-X
Model TCR-2 Track Circuit Rectifier	010133-X
Model TCR-3 Track Circuit Rectifier	010134-X
Model TCR-5 Track Circuit Rectifier	010135-X
Model TCR-6 Track Circuit Rectifier	010130-5X

ADJUSTABLE RESISTANCE UNIT

TYPE 603

The Type C Track Circuit normally employs the use of Safetran's Type 603 adjustable resistor, Part Number 029603-2X. This resistance unit is assembled on a procelain base with 4-1/4 inch mounting centers. It is adjustable between .482 and 5 ohms, 1.73 maximum amperes. The Type 603 is rated to AAR standard of 15 watts. It measures 3-3/4 inches in height, 5 inches in width, and 1 inch in depth.

ORDERING INFORMATION

To Order: Specify Type 603, 5 ohm adjustable resistance unit and Part Number 029603-2X.

For additional ordering information for the above resistance unit, as well as other types, see the resistance unit section of this catalog.

Safetran Systems Corporation

Instruction & Maintenance

AC/DC Track Circuit

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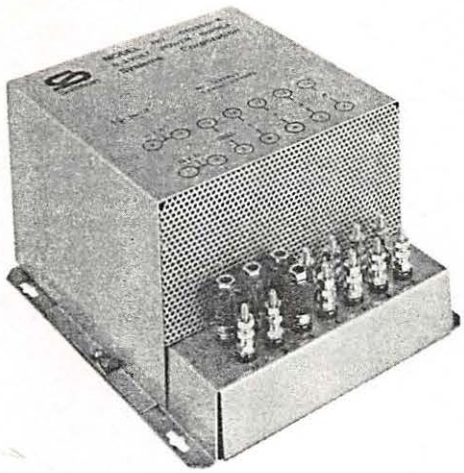
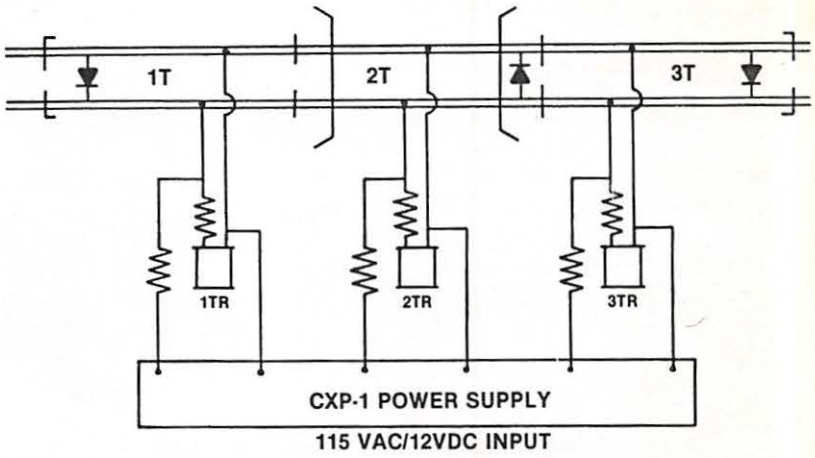
I&M 010350-500
Revised 9/80

CXP-1 Type C Power Supply

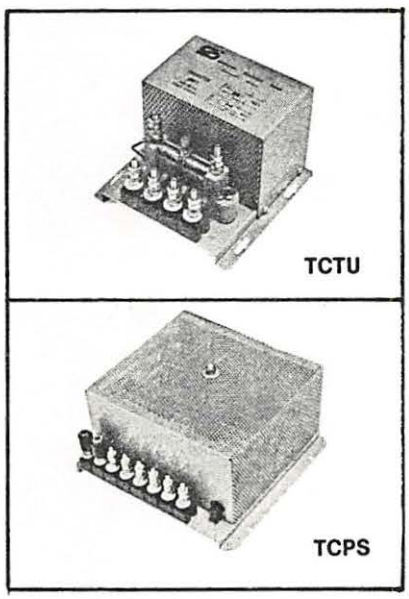


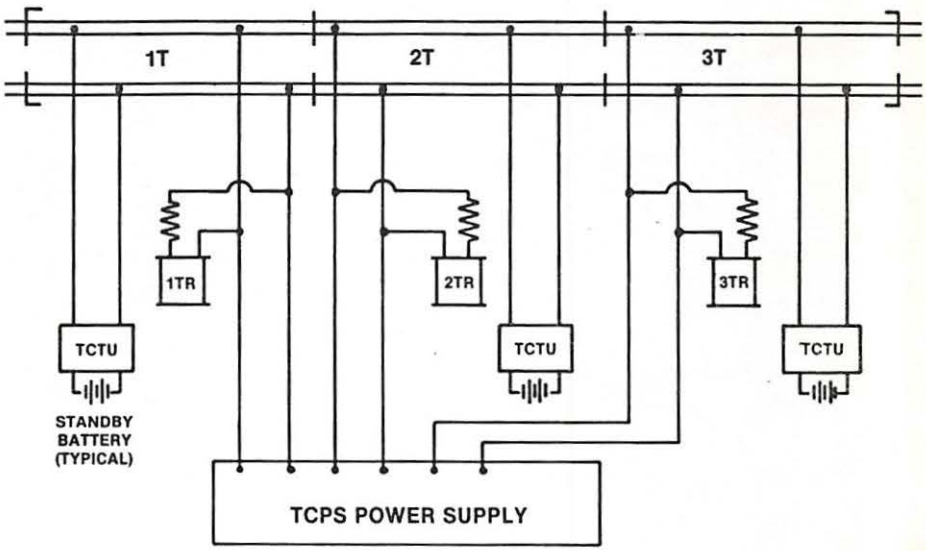


The CXP-1 Type C Power Supply employs a track feed transformer, power transfer relay, and standby inverter in a single housing. The CXP-1 acts as a track feed transformer when the circuit is operated with 115 VAC power. In the event of AC interruption, the CXP-1 converts standby battery power to 6.3 VAC through the use of its solid-state inverter.

The CXP-1 is capable of operating up to 4 track circuits through 4 independent secondary outputs of 6.3 VAC rated at 3.5 amperes each. Inputs are provided for both 115 VAC commercial power and 12 VDC standby battery power.

TCPS-TCTU Power System





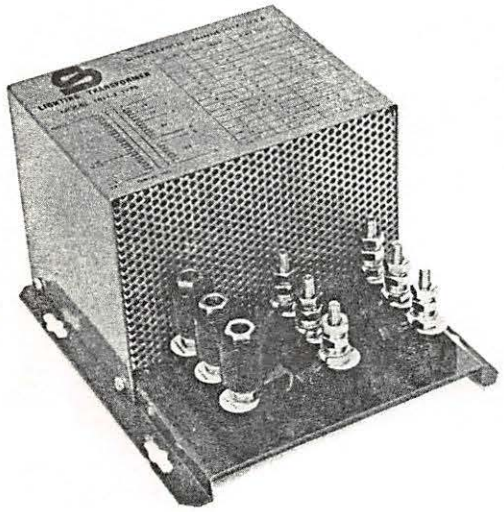
The TCPS-TCTU is a two unit power system consisting of the TCPS (Track Circuit Power Supply) housed at the crossing and the TCTU (Track Circuit Transfer Unit) which is housed at the opposite end of the track circuit.

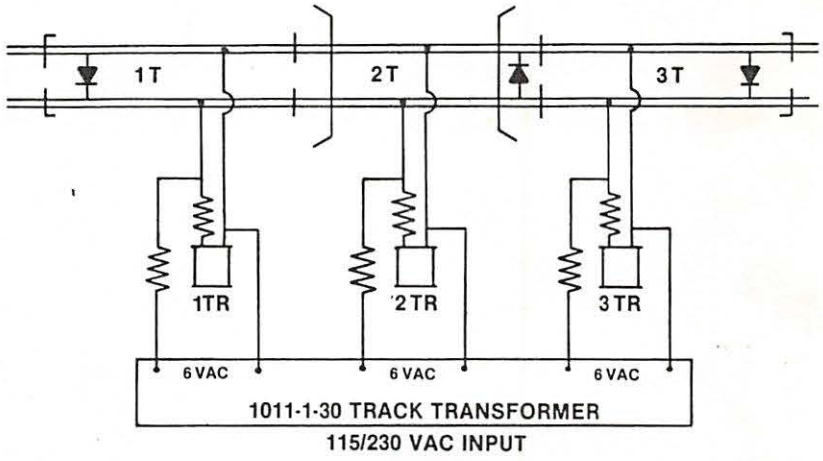
Type C AC/DC Track Circuit Power Supplies

The Type C Track Circuit can be energized with a variety of power supplies. Power supplies available from Safetran include:

- 1011-1-30 Track Transformer
- 12/6-3 DC-AC Inverter
- CXP-1 Type C Power Supply
- TCPS-TCTU Type C Power System

1011-1-30 Track Transformer



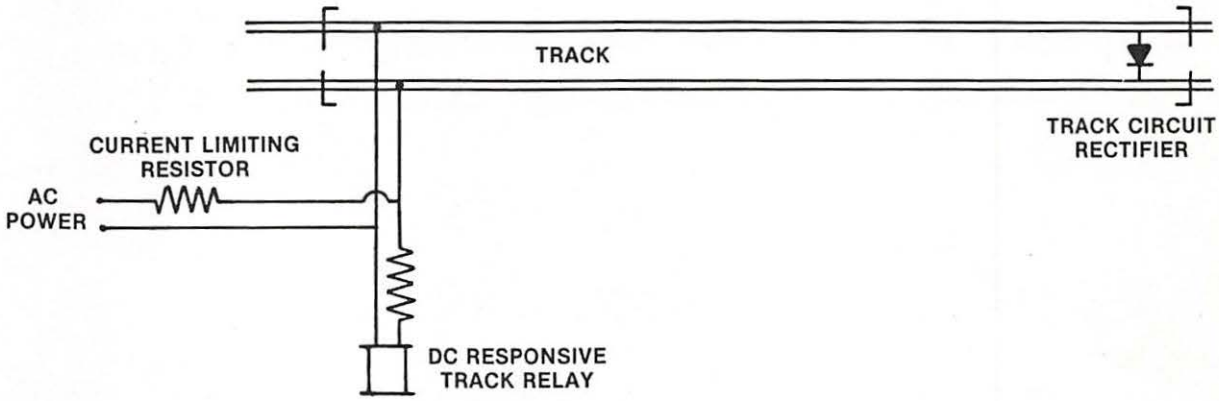


The 1011-1-30 Track Transformer is a 115/230 VAC operation power supply with three independent 6 VAC tapped outputs, each rated at 5.0 amperes.

The track transformer can be used in conjunction with a power transfer relay normally energized by AC Power. In the event of commercial AC power failure, the relay will drop out allowing AC from a battery powered inverter to operate the track transformer.

The 1011-1-30 measures 5-1/8 inches high, 7-3/8 inches wide, 8-3/8 inches long, and weighs 9-3/4 pounds.

Type C AC/DC Track Circuit



Introduction

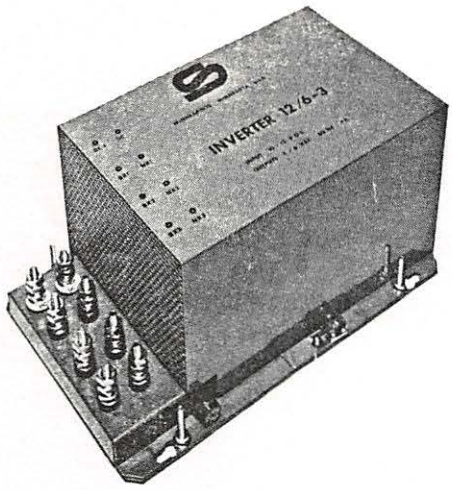
Safetran's AC/DC or Type C Track Circuit is a means of train detection in conjunction with grade crossing warning systems. It provides better shunting sensitivity than a conventional track circuit, and locates all commercial AC power components in a single centralized housing at the crossing.

A standard grade crossing warning system uses three distinct track circuits defined by insulated joints. Two of the circuits detect the approach of a train, while the third detects a train on the island circuit or the crossing itself.

With the Type C Track Circuit, AC is applied across the rails at one end of the circuit and is half-wave rectified to DC at the opposite end. This DC energizes a DC responsive track relay. When the rails are shunted, AC does not reach the recifier. No DC appears in the circuit and the track relay is de-energized. The track relay will also de-energize for any circuit break, rail break, or short circuit as with a conventional track circuit.

Necessary equipment for the Type C Track Circuit consists of an AC power supply, track rectifier, DC responsive track relay, and one or more resistors. Safetran offers several variations of each of these components enabling the customer to adapt a system to his own specifications.

12/6-3 DC-AC Inverter



The Safetran Model 12/6-3 DC-AC Inverter has been designed specifically for use with track circuits employing feed and DC track relay at one end and rectifier at the opposite end of the circuit.

It provides three outputs such that all track circuits at a conventional single track highway crossing may be supplied from one unit. Each output will deliver 6 VAC, 60 CPS from a 12 VDC battery or 5 VAC, 50 CPS from a 10 VDC battery. All outputs may be loaded up to 4 amperes.

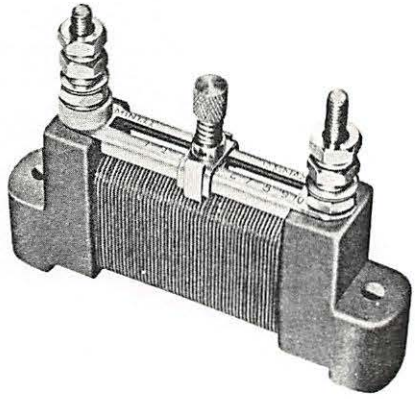
The 12/6-3 is completely solid state. It utilizes only two silicon power transistors with high reverse voltage breakdown. Zener diode and filter protection is incorporated to avoid component damage due to transients and surges.

The 12/6-3 DC-AC Inverter can be used as a continuous power supply when connected in parallel with an automatic or float type battery charger. The battery operates the circuit when commercial AC fails.

It will prove economical under these circumstances, replacing the feed transformer, power off relay, and standby 115 VAC inverter.

The 12/6-3 measures 6-1/8 inches high, 7-1/2 inches wide, 12-1/4 inches long, and weighs 14-1/2 pounds.

Type 603 Resistance Unit



The Type C Track Circuit normally employs the use of Safetran's type 603, 5 ohm, adjustable resistor. This resistance unit is assembled on porcelain base with 4-1/4 inch mounting centers. The minimum resistance is .482 ohms. The type 603 is rated to AAR standard of 15 watts. It measures 1 inch wide, 3-3/4 inches high, and 5 inches long.

The TCPS, having three outputs for track circuits, consists of three separate transformers, three resistance units, and a power transfer relay.

The TCTU consists of a power transfer relay, resistance unit, and two selenium half-wave rectifiers. The relay, when energized by AC, bridges one of the rectifiers across the track. In the event of an AC power outage, the relay will drop, and connect a standby primary battery to the rails. The other rectifier prevents battery DC from energizing the relay coil when AC is not present.

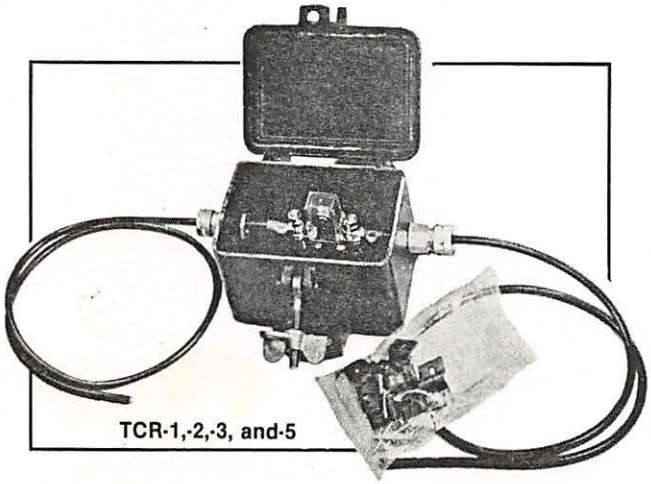
The advantage of the TCPS-TCTU system is that standby battery and inverter is not required at the signal case.

Both the Track Circuit Power Supply (TCPS) and Track Circuit Transfer Unit (TCTU) provide the high shunting sensitivity for the AC-DC track circuit required for light traffic lines in combination with an automatic transfer to standby battery in the event of AC power interruption.

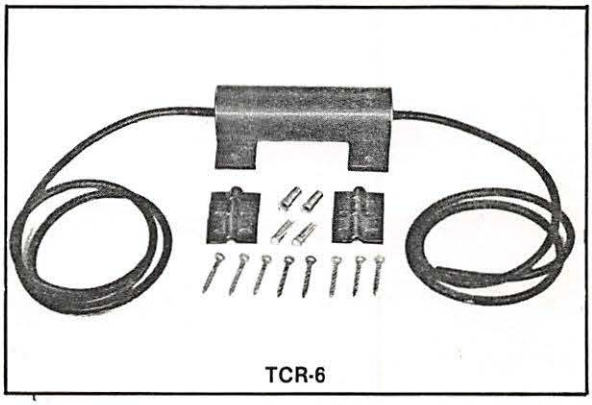
The TCPS measures 11-3/4 inches wide, 10-3/4 inches long, 5-1/2 inches high, and weighs 20 pounds.

The TCTU measures 7 inches wide, 7 inches long, 4-3/4" inches high, and weighs 6 pounds.

Track Circuit Rectifiers
Models TCR-1,-2,-3,-5, and -6



TCR-1,-2,-3, and-5



TCR-6

The AC-DC Type C Track Circuit requires a track circuit rectifier to transform AC track current to DC, allowing DC to energize the DC responsive track relay.

Safetran's Track Circuit Rectifiers (TCR) are constructed for mounting between or beside rails. Model TCR-1,-2,-3, and -5 are housed in a cast iron box with removable cover so that servicing is possible. The TCR-6 is a sealed type rectifier serviced as an assembly.

Models TCR-1,-2,-3, when furnished with bootleg pedestal, are 20 inches in height. Sufficient wire is provided for locating anywhere in the crosstie area. Stranpins are provided for connecting to rails and clips are included for fastening of the wire to the tie.

These units use avalance type silicon diodes which suddenly go into reverse conduction when a reverse surge exceeds 400 peak volts. Unlike normal diodes, these can absorb up to 300 watts of surge power. A model 700 equalizer and a choke coil assembly are included to absorb surge power beyond this level. Forward current rating is 4 amperes continuous.

Model TCR-2 is furnished with cast iron box suitable for lagging to ties. The TCR-3 is furnished with down set plate to allow mounting below ties for the protection against dragging equipment.

The Model TCR-5 is also housed in a cast iron box with down set plate for lagging to ties. The selinium rectifier, even with excess surge reverse voltage on a number of occasions, will restore to normal operation several times before failing. For additional rectifier protection, a Model 700 equalizer and a choke coil assembly are included. Forward current rating is 3 amperes continuous.

The Model TCR-6 is housed in a 1-1/2 inch diameter x 6-1/2 inch long aluminum cylinder with brackets for lagging to tie. The rectifier is an avalance breakdown diode which will withstand 400 peak inverse volts and is protected by a Model 700 sealed equalizer.

Type C Track Circuit Components
Ordering Information

Description	Part Number
Power Supplies	
Model 1011-1-30 Track Transformer	010500-1X
Model 12/6-3 DC-AC Inverter	010218-X
Model CXP-1 Type C Power Supply	010350-X
TCPS-TCTU Type C Control System	
TCPS (Track Circuit Power Supply)	010300-X
TCTU (Track Circuit Transfer Unit)	010303-X
Track Rectifiers	
Model TCR-1 Bootleg Mount	010130-X
Model TCR-2 Top of Tie Mount	010133-X
Model TCR-3 Downset Tie Mount	010134-X
Model TCR-5 Tie Mount (Selenium)	010135-X
Model TCR-6 Sealed Unit	010130-5X
Resistance Unit	
Type 603 Adjustable Resistor (5 ohm)	029603-2X
Relay	
Model E-5 Neutral Relay (4 ohm)	040300-26BX

Adjustment of an AC-DC Track Circuit

1. Set the adjustable resistor in series with the Power Pack to its maximum resistance value.

2. Disconnect the wire from positive coil terminal of Relay and connect a DC ammeter in series with the circuit.

3. Take note of working current (W.C.) rating of the relay which is shown on the relay cover. (Should be approximately 60 milliamperes)

4. Adjust the resistor in series with the relay to obtain a DC reading of 100% over the W.C. value. (e.g., if W.C. = 60 MA, adjust for 120 MA)

5. If 100% over W.C. rating cannot be achieved with relay resistor at minimum resistance, lower the resistance value of the resistor in series with the Power Pack, which will increase the Power output to the track circuit. Adjust only 25% of total resistance at a time. Do not drop below 25% of maximum resistance.

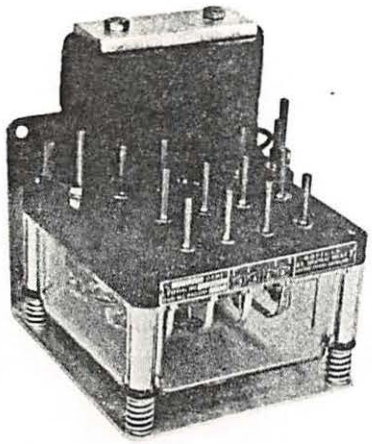
6. When 100% over W.C. is achieved, disconnect ammeter and reconnect relay coil in normal manner.

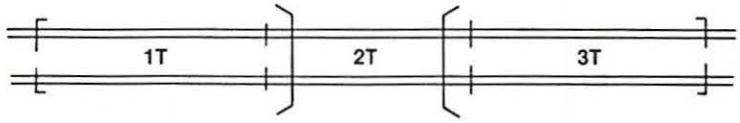
7. Place shunt between the rails at several points in the track circuit, including both ends. Verify that the relay de-energizes each time you shunt the track and re-energizes when shunt is removed.

This setup procedure should be made seasonally, as ballast resistance will change with the climate. (Ballast resistance is the amount of Ground Resistance which allows current leakage from rail to rail.) During a rainy season when the soil is damp, ballast offers less resistance from rail to rail. Therefore, less resistance in series with the relay would be required to obtain the 100% over W.C. of the relay. The 100% over W.C. value is used to prevent the relay from de-energizing during sudden temporary ballast resistance changes.

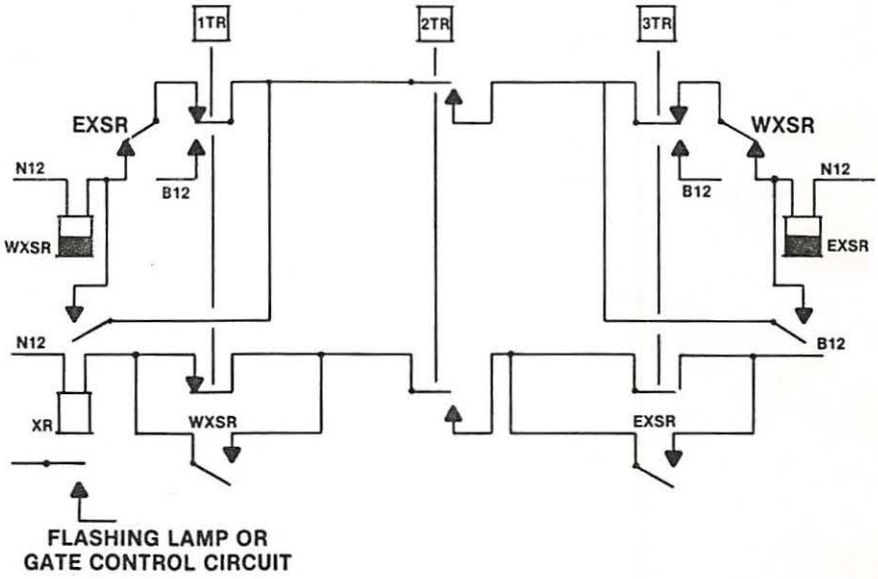
If proper W.C. cannot be obtained by above procedure, ballast resistance is abnormally low or a shunt exists somewhere in track circuit. Check all insulated joints, particulary in track switches and see that no uninsulated gage rods are in use.

Typical Type C Grade Crossing Warning Control System





TRACK RELAYS PER VARIOUS POWER SUPPLY SYSTEMS



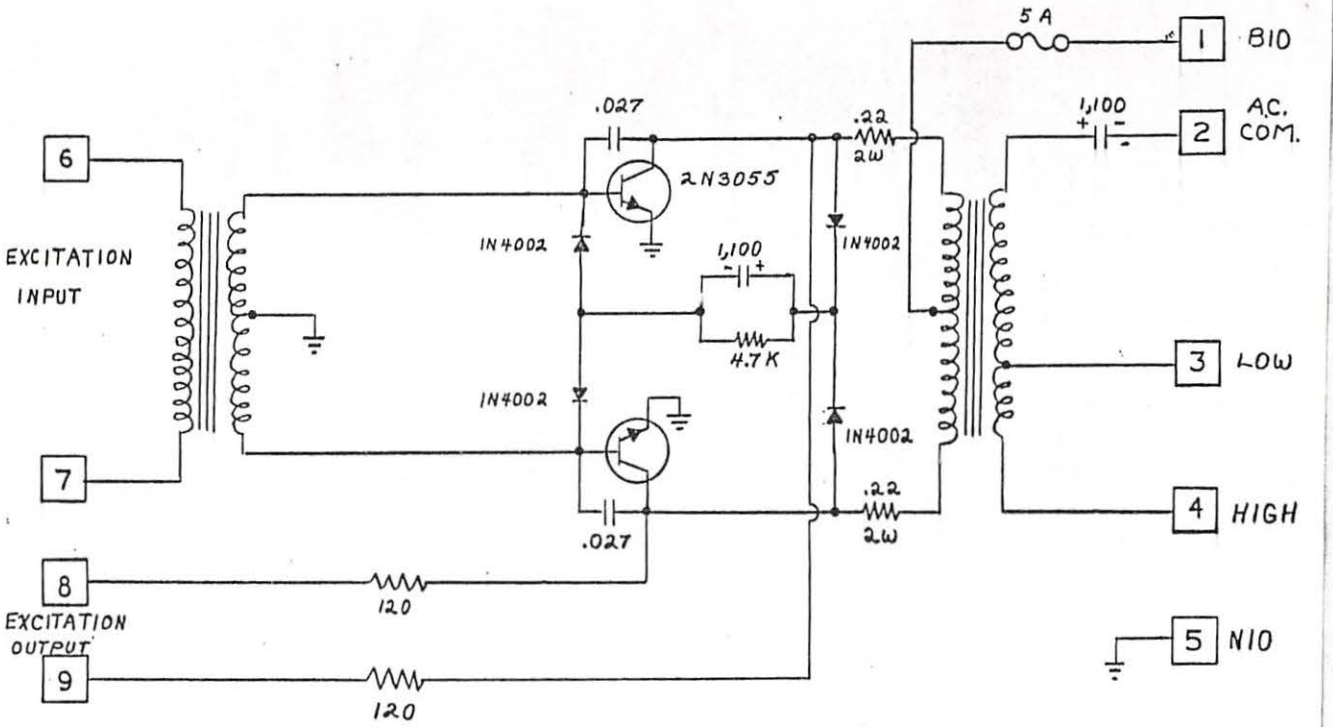
Safetran's Typical Type C Grade Crossing Warning Control System utilizes these AC/DC track circuits to detect a train approach or presence. A logic circuit clears the warning when the train has passed the crossing.

As a train approachs from the West and passes through 1T, 2T, and 3T track circuits, the 1TR, 2TR, and 3TR relays are de-energized. The approach circuit relay (1TR) in turn de-energizes the XR relay, causing it to operate the grade crossing warning. The 2TR relay is the island circuit relay, which also breaks the XR control circuit and provides positive warning where the train is physically blocking the crossing.

Directional stick relays enable the warning system to cease operation when a train has passed through the crossing in a through move, and occupies only the receding approach track circuit. Direction is established when the approach and island circuit relays de-energize in sequence.

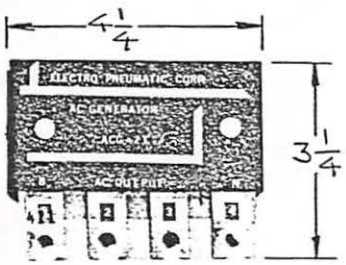
The directional stick relays are slow release, allowing them to remain energized if there is a moment between the 2TR energizing and the 3TR de-energizing. The warning system, with track relays normally energized by DC Power, is designed such that loss of DC Power to any control relay will cause the relay to de-energize. This in turn causes the XR relay to de-energize, starting operation of the warning system. Broken conductors in the control system such as rails, bonds, or wires prevent DC from energizing the track relay.

The Model E-5 Regular Releasing Neutral Relay is equipped with four dependent, heavy duty, front and back contacts. These contacts are rated to carry ten amperes continuously at first range voltages of 30 volts or less. The coil resistance is four ohms. Contact post designations are shown on the name plate on the front of the relay. The E-5 can be either wall or shelf mounted as desired. With mounting bracket, the E-5 measures 8-1/8 inches high, 6-1/8 inches wide, 6 inches long, and weighs 11 pounds.

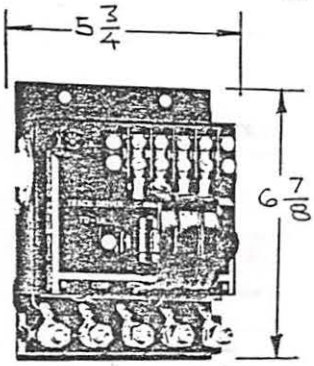


TRACK DRIVER TD-1A

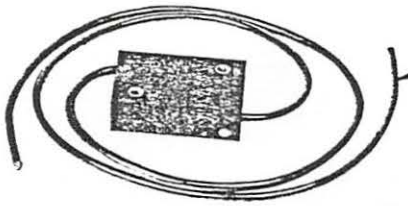
Electro Pneumatic Corporation		
PROJ: R.P. Finley	APP: EBA	DATE: 9/25/75



AC GENERATOR
ACG-2T
(1 3/4 HIGH)



TRACK DRIVER
TD-1A
(3 3/4 HIGH)

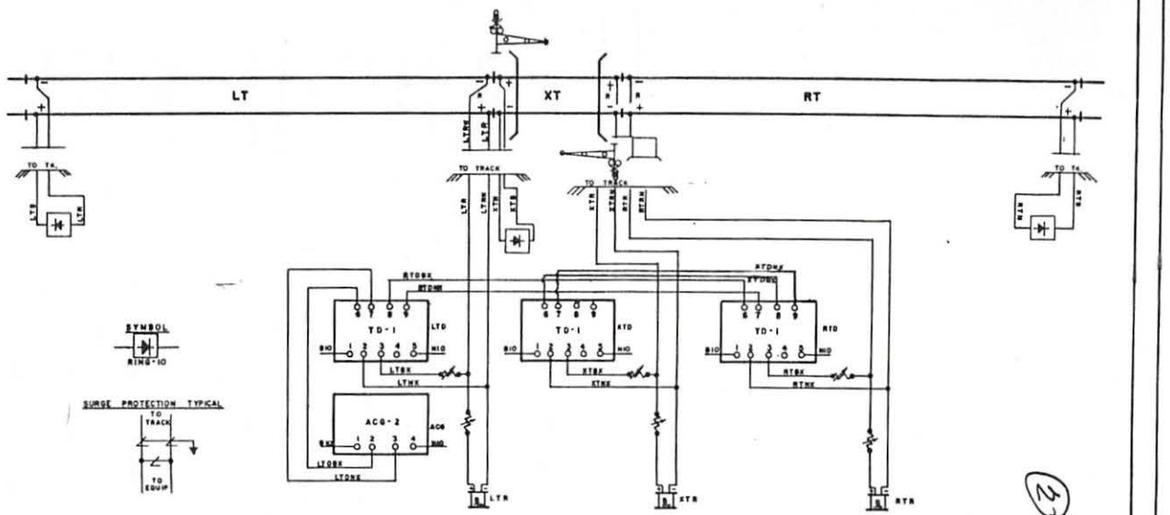


TRACK RECTIFIER
RING-10

3 × 4 3/4 × 1 1/2

ELECTRO PNEUMATIC CORPORATION
RIVERSIDE, CALIFORNIA

ELECTRO PNEUMATIC
CORPORATION
RIVERSIDE, CALIFORNIA U.S.A.



ELECTRO PNEUMATIC CORP. RUSTY RAIL TRACK CIRCUIT APPLICATION				
REVISIONS			DESIGNER	NUMBER
				A 71050
				SHEET 2 OF 2

AC-DC TRACK CIRCUIT (STYLE C)

(3)

GENERAL

The AC-DC track circuit equipment consists of an AC Generator(Model No. ACG-2), a Track Driver(Model No. TD-1), and a Track Rectifier(Model No. RING-10). This equipment produces the excitation to the track to operate a conventional 4 ohm signal relay. The advantages of the AC-DC track circuit are: 1) rusty-rail shunting performance, and 2) simple, low cost installation and maintenance. Applications for this type of equipment include branch line and industrial siding detection circuits and highway crossing protection.

OPERATION

The AC-DC track circuit equipment uses electronic circuits to convert battery voltage into an AC voltage that feeds the track. The AC Generator contains a free-running multivibrator, operating at 180 Hz., that produces a continuous square-wave output. Terminals are provided on the Track Driver for connecting the excitation from the AC Generator, and this voltage is amplified to produce the proper output power and impedance level to feed the track. The resulting AC Voltage on the track is about 7 volts. Because of the "transient" components of the square wave, there are also very high voltage spikes, measured as high as 50 volts, which help to penetrate films of rust between rail and wheel. This voltage will depend upon the conditions of ballast and shunting factors at the time of measurement, and is only mentioned here as a point of interest.

Each Track Driver is equipped with excitation output terminals which are used to feed the next Track Driver at the same location. This feature will permit many track circuits to be excited by just one AC Generator, resulting in one common frequency and phase for the entire group.

ELECTRO PNEUMATIC
CORPORATION
RIVERSIDE, CALIFORNIA U.S.A.

The RING-10 Rectifier is designed to be mounted on the side of a tie at the remote end of the track circuit. This assembly is encapsulated in a heavy cast aluminum housing, and comes equipped with lag bolts and bondstrand cable pigtails that are ready for direct connection to the rails. Surge protection is included in the RING-10 assembly, requiring no other external protection or hardware.

ADJUSTMENTS

There are no operating controls on the AC-DC Track Circuit devices, but the track circuit contains an adjustable resistor in the AC circuit feeding the track and another in the relay circuit. The exact setting of the AC adjustment is not critical, but maintenance people should be aware of the effect this adjustment will have on shunting. It has been determined that the most effective rusty-rail shunting will be obtained with a high resistance setting of the AC adjustment. This may be set at 11 ohms if the rust conditions are severe in the local area. However, the track circuit is effected by low ballast conditions more because of this adjustment, and if the local conditions have a reputation for heavy ballast losses it would be wise to reduce the initial resistance setting to about 5 ohms, after this has been proved to be a problem. The resistance may be cut out completely under adverse conditions, if need be, but this should not be necessary.

The relay adjustment should be used to set the correct operating current for the type relay being used. This should be done following the AC adjustment since these settings will interact.

(5)

RUSTY-RAIL SHUNTING EQUIPMENT

The conventional DC track circuit has always suffered a loss of shunting ability when large formations of rust accumulate on the rail surface. This type of failure has been overcome by the addition of a relatively high level AC voltage which is sufficient to ionize the thin film of oxide between the wheel surface and the rail, resulting in a lower effective shunting resistance. The source for obtaining the AC voltage can be the 60Hz. power line, through an appropriate transformer, but the shunting protection will of course disappear during power outages. The logical method of obtaining continuous shunting protection is by the use of power-converting equipment which operates from the stand-by battery system always located at grade corssings, generating the AC through the use of electronic circuitry. The following equipment was developed to accomplish this task.

AC GENERATOR

The AC Generator is a solid-state oscillator circuit which uses DC voltage from the signal-case battery to generate an AC voltage. The circuitry contained in the ACG-2 consists of an Astable Multivibrator, biased by a zener diode regulator circuit for stability, with two buffer amplifiers connected to output terminals. These outputs are equal in value, but 180 degrees out of phase, for driving the push-pull amplifiers in the Track Driver units. The frequency of operation is 180 Hz.

The voltage out of the AC Generator is used as an excitation signal for the Track Driver, which provides the power amplification needed to develop a high level AC voltage to impress on the rails.

TRACK DRIVER

The Track Driver circuit consists of a push-pull, class B power amplifier, transformer coupled to the rail connections. The input circuit is also transformer coupled and will accept signals from the AC Generator, or from another Track Driver from its excitation output terminals. Incomming signals are essentially a square-waveform, and are clamped by the diode to form a positive going drive signal to the amplifiers.

A current limiting and surge protection network is used in the collector circuits to immunize the active elements against abuse from lightning and the transients. The limiting resistors serve a dual purpose as protective elements and as a collector load resistor during the time the track is shunted. This enables the circuit to provide excitation outputs even when the track circuit is occupied, resulting in a continuous excitation signal regardless of train moves. Excitation outputs are taken directly from the collectors of the amplifier transistors, through isolating resistors which protect the circuits against accidental wiring errors, or temporary shorts during handling.

The surge protection circuitry is designed specifcally for protection against high voltage spikes coming in from the rails. This circuit consists of the two diodes between the collectors, which connect to the resistor and capacitor, and coupled through these to the diodes on the bases. During normal operation the capacitor charges to a DC voltage approximately equal to twice the DC supply voltage. This level is equal to the peak positive swing of either collector. When a voltage surge appears, the circuit protects itself by coupling the positive-going transient to the base of the turned-off transistor, causing it to turn on. When the transistor turns on, current caused by the spike is drawn through the collector in the normal forward bias direction, and no damage is done. Current is limited by the resistors and the mutual inductance of the transformer windings. This type of circuit offers protection against the most delicate transistor parameter, collector-emitter breakdown, which results in burn-out even though the collector current is limited.

In the event of internal shorts, fuse protection is used to protect the circuit wiring, on the Track Driver. The AC Generator has current limiting resistors and does not require fuse protection.

SYSTEM OPERATION

The basic track circuit operation is the same as for a conventional Style C circuit, with the exception that the source of AC is the electronic circuitry instead of from the line. Application drawings are attached.

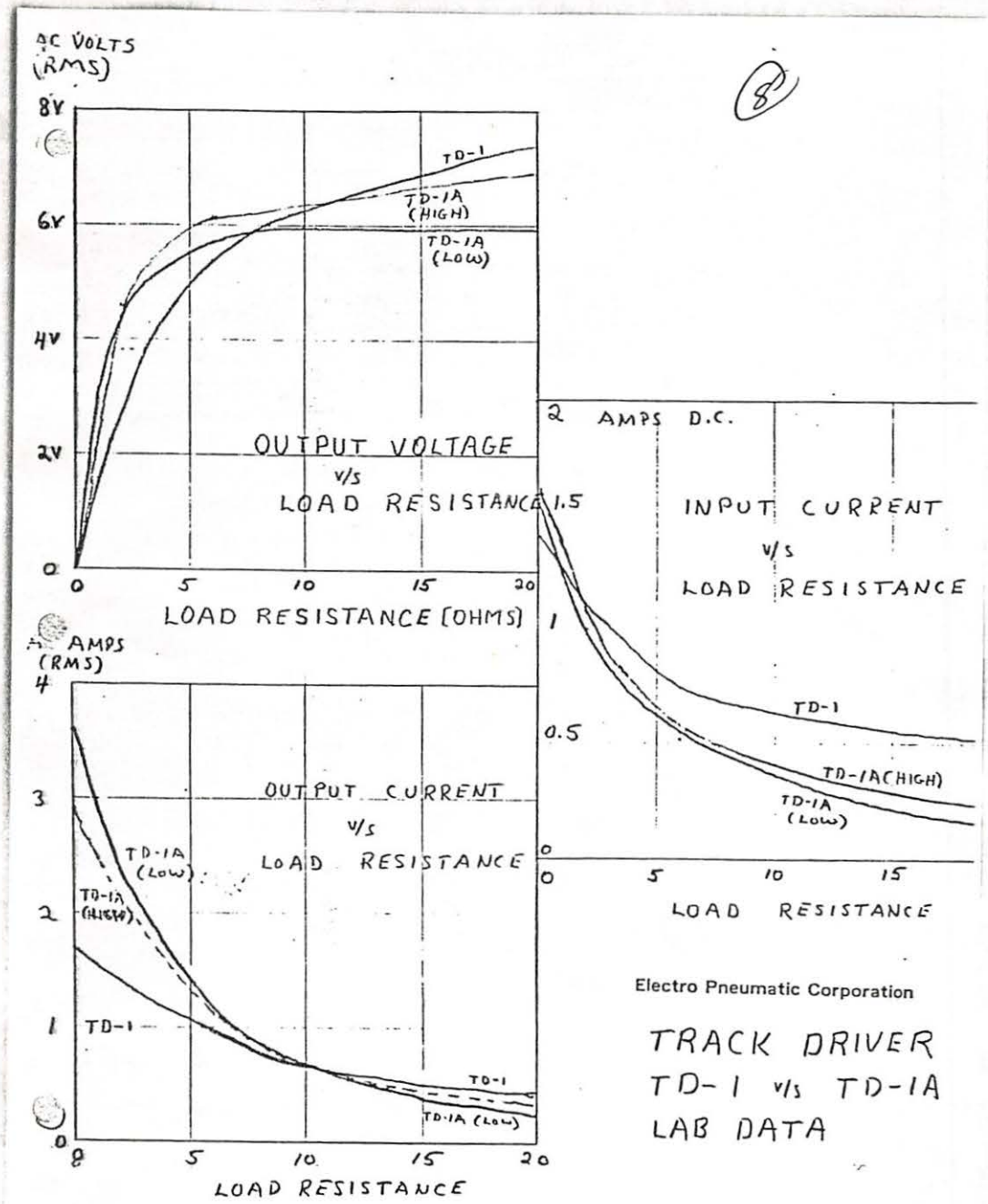
AC/DC TRACK CIRCUIT (STYLE C)
AND
DC-DC CONVERTER
CURRENT REQUIRED AT 10-12 vdc.

ACG-3 SUPPLY CURRENT:

	LOAD		
	5 ohm	1 ohm	∅ ohm
EACH 10-1	.160 Amps	.240 Amps.	.335 Amps
		LOAD	
	1000 ohm	500 ohm	250 ohm
EACH 10-10	35 mA	40 mA	45 mA

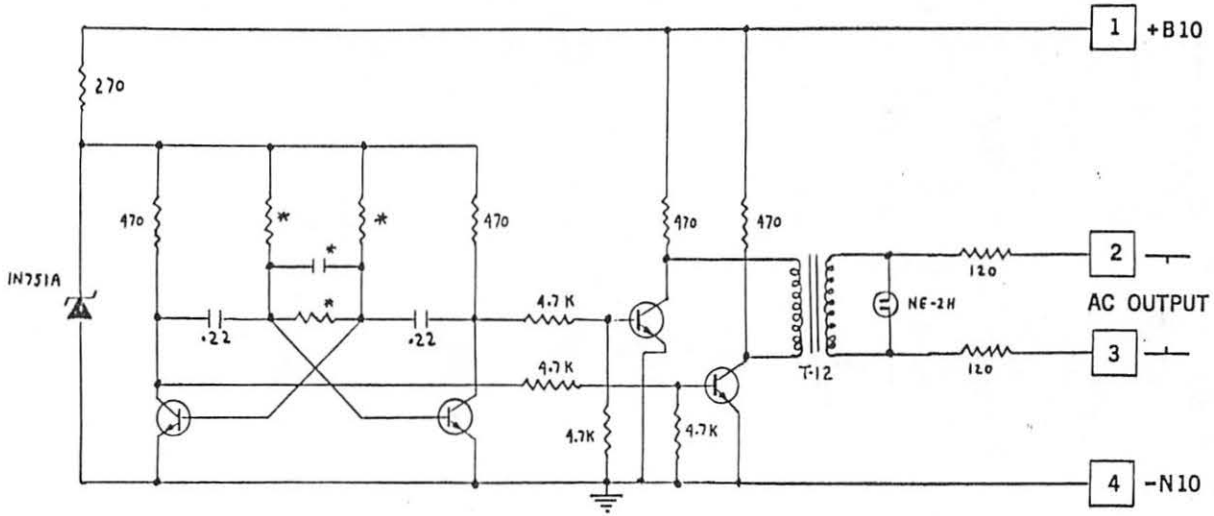
ACG-2T SUPPLY CURRENT - 70 mA

	LOAD		
ADD FOR	5 ohm	1 ohm	∅ ohm
EACH TD-1A	500 mA	1.0 Amp.	1.8 Amps.



Electro Pneumatic Corporation

TRACK DRIVER
TD-1 V/S TD-1A
LAB DATA



ALL RESISTORS 1/2 WATT, 5%

ALL TRANSISTORS 2N2222 A

* SELECTED VALUES SET OPERATING FREQUENCY TO 180 Hz.

6/75

Electro Pneumatic Corporation
AC GENERATOR
MODEL ACG-2 (T)

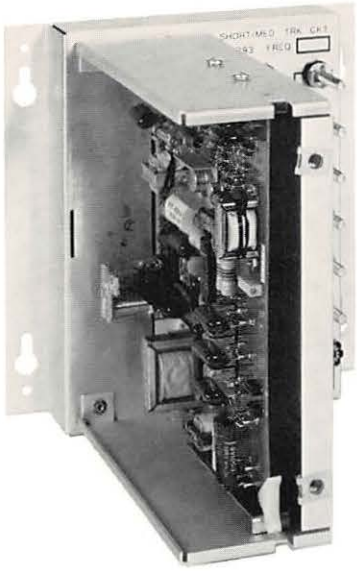
Safetran

SHORT RANGE TRACK CIRCUIT

- SHARP DEFINITION
- SIX FREQUENCIES 10.0 TO 20.2 kHz
- FOUR WIRE RAIL CONNECTION

Short Range Track Circuit (SRTC) is an audio frequency track circuit, utilizing frequncies from 10.0 kHz to 20.2 kHz. It is intended for such uses as highway crossing islands, activating hot bearing detector installations, obtaining release of electrically locked switches, or any application where short operating distances and sharp definition are required. For frequency and circuit length application, see SRTC manual.

The SRTC transmitter/receiver is contained on a single plug-in printed circuit module (6A380-f). The same module is used in the Motion Sensor 350, thus providing interchangeability between systems. Surge protection built into the 6A393 assembly eliminates the need for external devices except for primary arresters.



ORDERING INFORMATION

To Order: Specify Frequency and Part Number.

Frequency in kHz	Part Number	
	Complete	Module Only
10.0	6A393-10.0	6A380-10.0
11.5	6A393-11.5	6A380-11.5
13.2	6A393-13.2	6A380-13.2
15.2	6A393-15.2	6A380-15.2
17.5	6A393-17.5	6A380-17.5
20.2	6A393-20.2	6A380-20.2

SPECIFICATIONS

Dimensions:
9-1/4 inches high
7-1/2 inches wide
8-3/4 inches deep

Weight:
11 pounds

Temperature Range:
-40° F to +160°F
(-40°C to +57°C)

Input:
Voltage - 9.5 VDC minimum
15.0 VDC maximum

Current - 400 mA

Relay Drive:
Operates any relay with at least 250 ohms coil resistance

Circuit Length:
Up to 150 feet

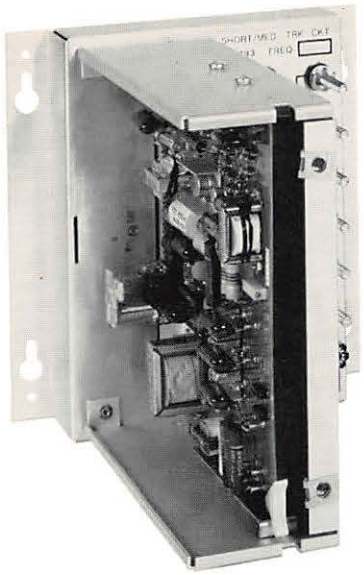
Safetran

MEDIUM RANGE TRACK CIRCUIT

- SHARP DEFINITION
- EIGHT FREQUENCIES 2,140 TO 8,300 Hz
- FOUR WIRE RAIL CONNECTION

Medium Range Track Circuit (MRTC) is an audio frequency track circuit, supplied in a frequency range from 2140 Hz to 8300 Hz, which offers longer operating distances than the SRTC along with improved operation under low ballast resistance conditions. It is intended for any use where short operating distances and sharp definition are required, such as highway crossing islands, hot bearing detector installations, and releasing sections for electrically locked switches. For frequency and circuit length application, see MRTC manual.

The MRTC transmitter/receiver is contained on a single plug-in printed circuit module (6A380-f). The same module is used in the Motion Sensor 350, thus providing interchangeability between systems. Surge protection built into the 6A393 assembly eliminates the need for external devices except for primary arresters.



ORDERING INFORMATION

To Order: Specify Frequency and Part Number.

Frequency in Hz	Part Number	
	Complete	Module Only
2140	6A393-2140	6A380-2140
2630	6A393-2630	6A380-2630
3240	6A393-3240	6A380-3240
4000	6A393-4000	6A380-4000
4900	6A393-4900	6A380-4900
5900	6A393-5900	6A380-5900
7100	6A393-7100	6A380-7100
8300	6A393-8300	6A380-8300

SPECIFICATIONS

Dimensions:
- 9-1/4 inches high
- 7-1/2 inches wide
- 8-3/4 inches deep

Weight:
- 11 pounds

Temperature Range:
- -40° F to +160°F
- (-40°C to +57°C)

Input:
- Voltage - 9.5 VDC minimum
  15.0 VDC maximum
- Current - 400 mA

Relay Drive:
- Operates any relay with at least 250 ohms coil resistance

Circuit Length:
- Up to 300 feet

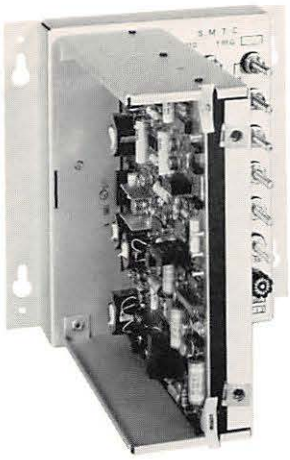
Safetran

SHORT MODULATED TRACK CIRCUIT

- MODULATED AUDIO FREQUENCY TRACK CIRCUIT
- ELEVEN FREQUENCIES 4.0 TO 20.2 kHz
- FOUR WIRE RAIL CONNECTION

Short Modulated Track Circuit (SMTC) is a frequency-shift modulated, audio frequency track circuit available in eleven frequencies from 4.0 kHz to 20.2 kHz. While intended for use as the island track circuit at highway crossings, the SMTC can be used for any application requiring a short, high-definition, audio-frequency track circuit. For frequency and circuit length application, see SMTC manual.

The SMTC transmitter and receiver are mounted on a single plug-in printed circuit module (62509-f). Surge protection is built into the 71010 assembly with the exception of primary arresters. The same 62509 module is also used in Motion Sensor 500 and Motion Sensor/GCP 600.



ORDERING INFORMATION

To Order: Specify Frequency and Part Number.

Frequency in kHz	Part Number	
	Complete	Module Only
4.0	71010-4.0	62509-4.0
4.9	71010-4.9	62509-4.9
5.9	71010-5.9	62509-5.9
7.1	71010-7.1	62509-7.1
8.3	71010-8.3	62509-8.3
10.0	71010-10.0	62509-10.0
11.5	71010-11.5	62509-11.5
13.2	71010-13.2	62509-13.2
15.2	71010-15.2	62509-15.2
17.5	71010-17.5	62509-17.5
20.2	71010-20.2	62509-20.2

SPECIFICATIONS

Dimensions:
9-1/4 inches high
7-1/2 inches wide
8-3/4 inches deep

Weight:
11 pounds

Temperature Range:
-40° F to +160°F
(-40°C to +57°C)

Input:
Voltage - 9.5 VDC minimum
15.0 VDC maximum

Current - 200 mA maximum

Relay Drive:
Operates any relay with at least 250 ohms coil resistance

Circuit Length:
Up to 300 feet

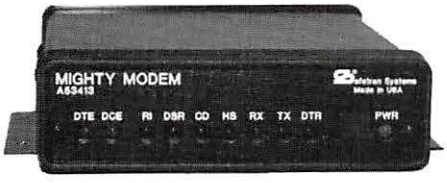
SIGNAL B-12-4
COMM F-1-4

Safetran

SIGNAL B-12-1
COMM F-1-1

MIGHTY MODEM

A53413



- MAXIMUM OPERATING SPEED OF 14,400 BAUD
- HOUSED IN A RUGGED, COMPACT METAL CASE
- FULL-TEMPERATURE, DC POWERED UNIT
- EASILY CONFIGURED AS A DCE OR DTE DEVICE VIA A REAR-PANEL SWITCH SETTING
- WALL, SHELF, OR RACK MOUNTING
- FRONT-PANEL MOUNTED LED'S PROVIDE INDICATIONS OF MODEM OPERATIONAL STATUS
- BUILT-IN SPEAKER ENABLES MAINTAINER TO MONITOR A DIAL-OUT IN PROGRESS
- FCC PART 68 APPROVED AND CANADIAN DOC APPROVABLE

The Safetran Mighty Modem is an auto-answering, Hayes compatible, dial-up modem capable of operating over standard dial-up telephone lines. The unit is designed for use in signal and communication applications requiring a full temperature dial-up device, and is compatible with Safetran's Event Analyzer/Recorder (SEA/R) and HD/Link™.

SPECIFICATIONS

Power:	9.0 to 34.0 VDC
Isolation:	2000V chassis-to-battery and battery-to-line isolation provided by on-board DC/DC converter
ESD Protection:	10 kV on the serial port
Surge Protection:	Secondary surge protection provided on the front end of the on-board power supply. External primary surge protection recommended.
Operating Temperature:	-40° F to +160° F (-40° C to +71° C)
Humidity:	95% non-condensing
Line Requirements:	Public switched telephone network
Baud Rate:	Automatically adjusts up to maximum of 14,400 baud
Auto Answer Capability:	Selectable via S-register S0
Compatibility:	Supports V.34bis, V.FC, V.32bis, V.32, V.22bis, V.22A/B, V.23, V.21, Bell 212A and 103
Command Structure:	Standard AT commands with extensions
Dimensions:	7.91 inches (20.09 centimeters) long 6.87 inches (17.45 centimeters) wide 1.75 inches (4.45 centimeters) high
Weight:	2 pounds (0.9 kilograms) (approximate)

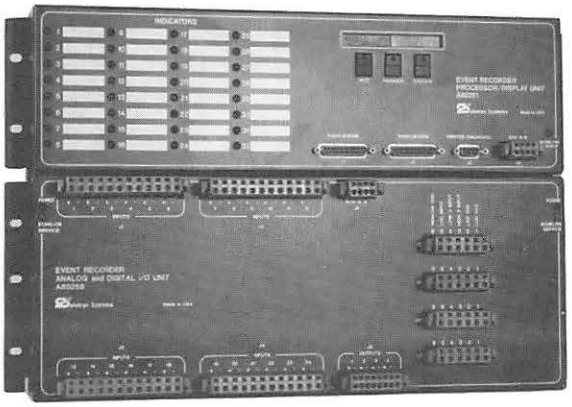
ORDERING INFORMATION

To Order: Specify the part numbers listed below.

Item	Part Number	Comments
Mighty Modem	9000-53413-0001	
Serial Cable	Z706-00200-0925	Supplied when modem ordered with SEA/R (80250)
4-Conductor Phone Cable	Z706-00211-0005	Supplied with all Modem orders
Panel, 23-Inch Rack Mounting With 1 Analog Unit, A80261, and 1 Mighty Modem	8000-80260-0005	Analog Unit, A80261, is a 4-input analog interface device for use with the SEA/R (A80250)
Panel, 23-Inch Rack Mounting With 2 Analog Units, A80261, and 1 Mighty Modem	8000-80260-0006	Analog Unit, A80261, is a 4-input analog interface device for use with the SEA/R (A80250)
Panel, 23-Inch Rack Mounting with 1 Mighty Modem	8000-80260-000A	
Panel, 19-Inch Rack Mounting with 1 Analog Unit, A80261, and 1 Mighty Modem	8000-80260-0009	Analog Unit, A80261, is a 4-input analog interface device for use with the SEA/R (A80250)
Panel, 19-Inch Rack Mounting with 1 Mighty Modem	8000-80260-000B	
Shelf, 23-Inch Rack Mounting with 1 Mighty Modem	9000-53415-0001	
Shelf, 23-Inch Rack Mounting with 2 Mighty Modems	9000-53415-002	
Shelf, 23-Inch Rack Mounting with 3 Mighty Modems	9000-53415-003	
Shelf, 19-Inch Rack Mounting with 1 Mighty Modem	9000-53415-005	
Shelf, 19-Inch Rack Mounting with 2 Mighty Modems	9000-53415-006	

EVENT ANALYZER/RECORDER (SEA/R)

Model A80250



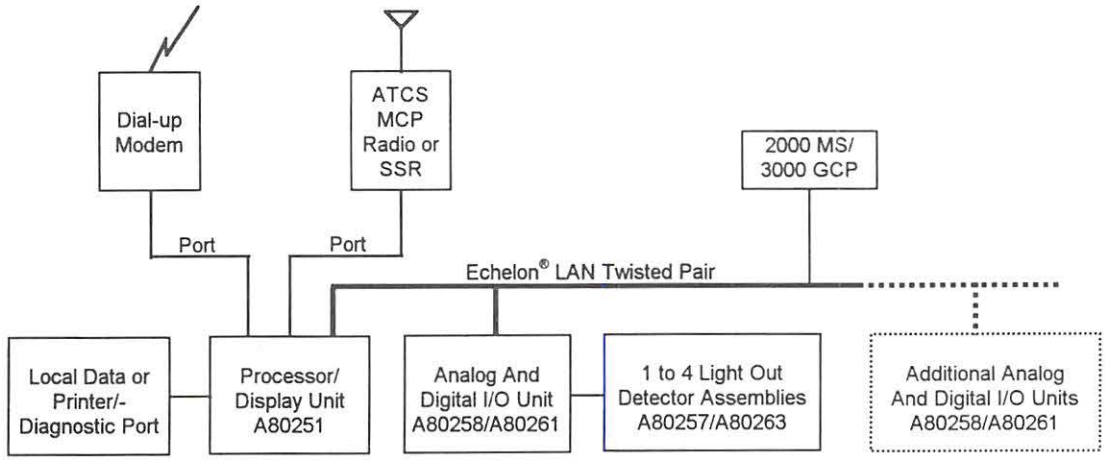
Processor/Display Unit, A80251, And
Analog And Digital I/0 Unit, A80258

- **AC and DC voltage monitoring**
- **Light out monitoring**
- **Warning time limits**
- **Alarm functions from events or a combination of events**
- **Other typically monitored functions including:**
  - **Low battery voltage**
  - **AC power**
  - **Crossing warning equipment**
  - **Stick circuit operation**
  - **Track occupancy**
  - **Unauthorized facility entry**
  - **Interlocking logic operation**

The microprocessor-controlled Safetran Event Analyzer/Recorder (SEA/R) is a low-cost, high performance, stand-alone system designed for continuous real-time monitoring and recording of a wide range of functions associated with a crossing, interlocking, or similar installation. A basic SEA/R installation can monitor up to 30 separate functions including 24 digital inputs, 4 analog voltage/current inputs, and 2 dedicated internal functions (temperature and battery voltage). The quantity of both digital and analog inputs is expandable, and the SEA/R is capable of storing a minimum of 10,000 events. Alarms and LED indications are generated in response to user programmed combinations of inputs, outputs, and internally-stored states which can then be reported as they occur to a central dispatching/monitoring location via radio or telephone modem. The alarms serve to inform railroad maintenance and operating personnel of equipment operating status, malfunctions, and/or other impending problems. The flexible user program allows the SEA/R to be used virtually anywhere to record and store event data and to monitor equipment operation.

User interfaces, including RS232 ports for radio, modem, and local laptop computer or serial printer, are provided to accommodate virtually any recorder application. Loading of system configuration information, including executive software, may be performed either in the field or remotely. The flexible software interface enables the user to easily assign monitor/alarm functions. A built-in alphanumeric display, push-button switches, and LED indicators permit a local maintainer to view the status of the monitor/alarm functions, reset alarms, etc. All maintenance functions can be performed without a laptop computer. Space is provided on the front panel adjacent to each LED indicator to label the associated programmed function.

The SEA/R uses a modular design to permit selection of only those assemblies required for a specific site. A typical basic SEA/R installation consists of two assemblies: a processor/display unit (A80251) and an analog and digital I/0 unit (A80258). Optional light out detector/current detector assemblies (80257 and 80263) and all external monitor inputs are connected to the analog and digital I/0 unit, which interfaces with the processor/display unit via Echelon® twisted pair bus. The processor/display unit permits monitoring, recording, and alarm reporting of events associated with lamp drive circuits, analog voltages, plus additional digital inputs. Also available are the A80261 4-Input Analog Unit which provides analog input circuits only and the A80258-02 Digital I/O Unit which provides digital input circuits only. Communications with a variety of technologies is supported via the Echelon® bus or serial ports and include ATCS MCP radio, spread-spectrum radio, and telephone dial-up modem. Protocols that are fully supported include ATCS Specification 200, Union Pacific standard data, plus AAR recommended event recorder protocol. Additional protocols can also be accommodated.


Dial-up Modem
ATCS MCP Radio or SSR
2000 MS/ 3000 GCP
Port
Port
Echelon® LAN Twisted Pair
Local Data or Printer/- Diagnostic Port
Processor/ Display Unit A80251
Analog And Digital I/O Unit A80258/A80261
1 to 4 Light Out Detector Assemblies A80257/A80263
Additional Analog And Digital I/O Units A80258/A80261

Safetran Event Analyzer/Recorder System

The SEA/R may also be used as a substitute for the 80015 Data Recorder Module in the Safetran Modle 2000 Motion Sensor (MS) and Model 3000 Grade Crossing Predictor (GCP). A special interface module (80255 or 80265 depending on MS/GCP processor module used) replaces the 80015 module in the MS/GCP and enables the SEA/R to record train move parameters and errors via the MS/GCP front panel RS-232 connector and the Echelon® LAN twisted pair bus. Train move parameters recorded include track identification (T1or T2), warning time, detected speed, average speed, and island speed.

To further enhance the capabilities of the SEA/R, Safetran has developed the GEO LASER software. This special analysis and graphing software permits office personnel to thoroughly examine and analyze recorded data stored in the SEA/R log. Stored event data from analog and digital inputs, digital outputs, and alarms can be displayed in graph form on a PC monitor, analyzed using the program tools, and then downloaded to a printer for a hard copy. Multiple events can be graphed simultaneously for comparison purposes. This software is Windows® based and is designed to run under Windows®95 and NT only.

Processor/Display Unit (A80251)

The processor/display unit serves as the central processing unit and contains the microprocessor, real-time clock, event memory, communications ports, display, and all user interface connections and controls. All other assemblies in the system route data to be recorded to this unit where it is processed, stored, and when applicable, results in appropriate actions being initiated. The processor/display unit can also function as the communications hub to enable multiple recorders to use a single dial-up modem/radio connection.

Analog And Digital I/O Unit (A80258)

The analog and digital I/0 unit accommodates up to 24 digital and 4 analog voltage/current inputs, plus 4 digital outputs which can be used to drive external devices. The A80258 communicates with the processor/display unit via Echelon® LAN twisted pair wiring. The unit can be located up to 500 feet from the processor/display unit. All monitored and control circuits either terminate or originate on the unit via special connectors (supplied). The unit also monitors two dedicated internal functions (temperature and battery voltage). Input/output capability can be easily increased by simply adding additional analog and digital I/0 units (maximum 10 units) to the Echelon® LAN.

4-Input Analog Unit (A80261)

The 4-input analog unit provides four analog voltage/current inputs only and communicates with the processor/display unit via Echelon® LAN twisted pair wiring. The unit can be located up to 500 feet from the processor/display unit. All monitored circuits terminate on the unit via special connectors (supplied). Analog input capability can be easily increased by simply adding additional analog units to the Echelon® LAN.

Light Out Detector/Current Detector Assemblies (A80257 and A80263)

The light out detector/current detector assemblies are designed to monitor a single lamp, motor, or similar circuit of up to 30 amperes DC (positive or negative) or AC. Up to four detector assemblies are supported by each A80258 I/0 unit and each A80261 analog input unit. The A80257 detector assembly consists of a small printed circuit board containing a special Hall effect sensor and is equipped with a 10-foot cable terminated by a connector. The A80263 detector assembly consists of a printed circuit board with two Hall effect sensors and an edge connector. The detector assembly trigger points are user programmable and are retained in the processor/display unit.

The detector assembly can be interfaced to the monitored circuit/device in several ways:

- With the detector mounted on a standard AAR terminal that supplies the current to the monitored device
- The detector can be used in any convenient location with the lamp (or motor, etc.) circuit wire simply routed through the opening in the Hall effect sensor.

Specifications

Input Power	
Voltage	9-34 VDC (customer supplied). Reverse polarity protection up to 16.5 VDC
Monitored Inputs	
Digital	24 optoisolated (up to 36 VDC each) (+6 VDC to +36 VDC = energized, -20 VDC to +3.0 VDC = deenergized)
Analog	4 (0-360 volts AC or DC) (isolated ground) (0-36 volts for low voltage inputs)
Lamp Current	30 amperes each light out/current detect circuit; 120 amperes total (all four circuits)
Battery Backup	8 years for stored event data. Built-in real-time clock with 72-hour backup
Outputs	4 nonvital (isolated - open collector), 250 mA each (short circuit protected)
Minimum Number of Events	10,000
Alarm Conditions	User definable via software
Communications Interface	Safetran S³/Link™ Spread-Spectrum Radio (RS232 or Echelon® LAN) Safetran MCP radio (RS232 or Echelon® LAN) VHF radio (RS232)
Message Format Protocols	ATCS Specification 200 Union Pacific Standard Data AAR recommended event recorder protocol
Input/Output Display	32 LED indicators (user definable and identifiable) plus a 16-character alphanumeric display indicating date, time, and analog data. Push buttons permit selection of specific event data for viewing
External Recorder Interface Connections	Keyed to prevent incorrect connection of system modules and confusion with existing equipment

Specifications (cont.)

Surge Protection/Isolation: Primary surge protection recommended on all external interfaces including battery. Secondary surge protection provided on all boards. Meets all AAR requirements for isolation and grounding.

Mounting: 19-inch equipment rack, shelf, or wall (extensions/panels for 23-inch racks also available)

Environmental:

Temperature	-40° F to +160° F (-40° C to +71° C)

Dimensions/Weight:

Processor/Display Unit, A80251	19 inches (48.26 centimeters) wide 5.25 inches (13.34 centimeters) high 1 inch (2.54 centimeters) deep 3 pounds (1.36 kilograms) (approximate)
Analog And Digital I/0 Unit, A80258	19 inches (48.26 centimeters) wide 7 inches (17.78 centimeters) high 1.75 inches (4.45 centimeters) deep 2 pounds (0.91 kilograms) (approximate)
4-Input Analog Unit, A80261	5.9 inches (14.99 centimeters) wide 6.81 inches (17.30 centimeters) high 1.75 inches (4.45 centimeters) deep 1 pound (0.45 kilograms) (approximate)
Light Out Detector/ Current Detector Assembly, A80257	1.25 inches (3.175 centimeters) wide 2.0 inches (5.08 centimeters) high 0.5 inch (1.27 centimeters) deep 4 ounces (0.11 kilograms) (approximate)
Light Out Detector/ Current Detector Assembly, A80263	4.2 inches (10.67 centimeters) wide 2.14 inches (5.44 centimeters) overall, 1.025 inches (2.60 centimeters) enclosure height 3.0 inches (7.62 centimeters) overall with mounting flanges, 2.6 inches (6.60 centimeters) enclosure depth 12 ounces (0.33 kilograms) (approximate)

ORDERING INFORMATION

To Order: Specify the basic SEA/R part number (80250) plus the applicable prefix and dash numbers from the charts below.

CONFIGURATION CHART

8XXX-80250-X X X X

000=NO A80251
XXX=RESERVED FOR RAILROAD SPECIFIC APPLICATIONS - CONTACT SAFETRAN CUSTOMER SERVICE

0=NO 23" PLATE FOR A80251
2=W/23" PLATE D38761-01 (A80251 ONLY)

0=NO A80258 I/O UNIT
1=A80258-01 I/O UNIT ONLY
R=A80258-02 I/O UNIT ONLY
T=A80258-01 I/O UNIT W/23" PLATE D38761-02
U=A80258-02 I/O UNIT W/23" PLATE D38761-02

NUMBER OF			
A80257	LOD	A80263	LOD II
-XXX0	0	-XXX0	0
-XXX1	1	-XXXA	1
-XXX2	2	-XXXB	2
-XXX3	3		
-XXX4	4		

A80251 PROCESSOR MEMORY CAPCACITY		MINIMUM NUMBER OF EVENTS
DASH	SIZE	
-XX1X	128K x 8	10,000
-XX2X	256K x 8	20,000
-XX3X	512K x 8	40,000
-XX4X	1024K x 8	80,000
-XX5X	2048K x 8	160,000

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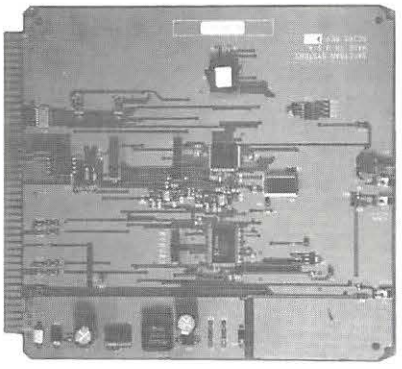
DATA RECORDER INTERFACE FOR 3000 GCP AND 2000 MS

Models 80255 and 80265



80265 Module

- **TRANSMITS DATA OVER A COMMON ECHELON® LINK**
- **COST EFFECTIVE**
- **ALLOWS DATA FROM MULTIPLE DEVICES TO BE RECORDED BY A SINGLE RECORDER**

Safetran has developed two new, low-cost, data recorder interface modules for use in both the Model 3000 Grade Crossing Predictor and the Model 2000 Motion Sensor. These modules provide an interface to the Safetran Event Analyzer/Recorder (SEA/R) and allow the SEA/R to record the same data types as previously recorded by the 80015 Data Recorder Module (i.e., warning time, speed and diagnostic data). Data is sent through the 3000 GCP or 2000 MS front panel 25-pin connector to the SEA/R via an Echelon® two-wire communication link. A special interface connector (80063), supplied with each interface module, plugs into the MS/GCP front panel 25-pin connector and provides connections for the Echelon® link as well as connections to daisy-chain multiple cases. Thus, all 3000 GCP and/or 2000 MS units at a crossing (each equipped with an interface module and an 80063 connector) can transmit data over the common Echelon® link to a single SEA/R. This greatly simplifies data retrieval and analysis.

The 80265 Data Recorder Interface Module is a retrofit device containing the necessary recorder and Echelon® circuits to interface any 3000 GCP presently in service, and equipped with either the 80014 or 80044 processor module, to the SEA/R. The 80265 module may also be used in the 2000 MS.

For applications employing the SEA/R and 3000 GCP units equipped with the 80214 Processor Module, the simpler 80255 Data Recorder Interface Module provides the physical interface between the Echelon® circuits on the 80214 module and the front panel 25-pin connector. The 80255 module also simplifies future expansion of the 3000 GCP diagnostic messages that are sent to the SEA/R. The 80255 module can only be used with the 80214 processor in the 3000 GCP or the 80224 processor in the 2000 MS.

The 80255 and 80265 interface modules replace the 80015 Data Recorder Module in both the 3000 GCP and 2000 MS cases when the SEA/R is used as the data recorder.

Echelon® is a registered trademark of Echelon Corporation

Specifications

Input Power

Voltage	9-16.5 VDC (supplied from host equipment)
Current	0.40 ampere (maximum)

Echelon® Interface: 80265 module provides the Echelon® interface, 80255 module uses the Echelon® interface on the 80214 and 80224 modules.

Surge Protection: **Built-in tertiary** surge protection. Secondary protection provided by motherboard in host case.

Environmental:

Temperature	-40°F to +160°F (-40°C to +71°C)
Humidity	95%, noncondensing

Weight: 80255 module - 5 ounces (0.14 kilogram) (approximate)
80265 module - 7 ounces (0.20 kilogram) (approximate)

ORDERING INFORMATION

To Order: Specify Data Recorder Interface Module, plus the appropriate part number from the table below.

Applications	Part Number
Retrofit device for use in all current 3000 GCP cases with 80014 or 80044 processor module, or in 2000 MS	80265
Use in dual-frequency 3000 GCP cases with 80214 processor module only, or in 2000 MS	80255
MS/GCP Interface Connector (interfaces 2-wire Echelon® link to front-panel 25-pin connector and provides connections to daisy-chain multiple cases)	80063*

* Provided with new cases containing 80255/80265 module or when 80255/80265 module ordered separately.

SENTINEL DATA LOGGER ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Logger Assembly w/512 event memory	90940-XY-0500
Logger Assembly w/1024 event memory	90940-XY-1000
Logger Assembly w/2048 event memory	90940-XY-2000
Logger Assembly w/4096 event memory	90940-XY-4000
Logger Module	25506-0-0500
Logger Module w/Memory Retention Battery	25506-1-0500
Memory Expansion Module w/no memory	25512-Y-0000
Memory Expansion Module w/512 event memory	25512-Y-0500
Memory Expansion Module w/1536 event memory	25512-Y-1500
Memory Expansion Module w/3584 event memory	25512-Y-3500

To order Julian date and I.D. number option, specify Y as 1 in part number. If this option is not required, specify Y as 0 in part number.

To order Memory Retention Battery in Logger Assembly, specify X as 1 in part number. If this option is not required, specify X as 0 in part number.

SPECIFICATIONS

Dimensions:
- 11-1/4 inches in height
- 8-1/2 inches in width
- 9 inches in depth

Temperature Range:
- −40° F to +160°F
- (−40°C to +70°C)

Time Base:
- Quartz crystal controlled 24 hour/ 60 minutes / 60 seconds
- Resolution: Minimum of 1 second
- Stability: Accurate to within one minute per year.
- Signature: Time is recorded with every change of input state and at 1:00 AM each day.

Memory:
- Solid-state RAM
- Capacity:
- Logger Module - 512 events Optional Memory Expansion Module - 1K, 2K, or 4K events
- Overcapacity:
- New data overwrites older data, memory stop switch allows memory to cycle through only once.

Power Requirements:
- 9 - 15 VDC Nominal
- 12 VDC, 100 mA

Data Inputs:
- Input Resistance: 5 kOhms
- Input Voltage:
- 8 inputs @ 8-30 VDC
- 3 inputs @ 8-30 VDC or VAC
- Response: Any event of 0.5 seconds or longer will be recorded.

Date: Optional Expansion Module
- Julian Format (1 through 365)
- I.D. Number Option
- 2048 number combinations

SENTINEL READER/PRINTER

The Reader/Printer is a portable unit that provides a digital display or printed copy readout of past events stored in the Data Logger's memory. The unit plugs into the Logger connector located on the top of the front panel of the Logger, or may be plugged into an AC Power Pack to print the Logger data from a Minilog.

The Reader/Printer is also used to set the time of day and Julian date in the Logger, print out events as they actually occur, or display the current time and input line status. In the print mode, the Reader/Printer prints out the data stored in the Logger's memory for a permanent record. Data in the Logger is not destroyed when using the Reader/Printer. A toggle switch on the unit allows selection of either a 12 hour or 24 hour time format.

When the Julian date and I.D. number option is incorporated in the Logger, the first line is always printed with the Julian date and I.D. number. This allows for back-dating by counting the recorded 1:00 AM entries through the tape. The second line printed is the beginning of the stored events, starting with the most recent event. The I.D. number on the first line is a binary number consisting of the preselected digits 1 and 0. The selection is made on the Logger Expansion Module by 3 DIP switches. There are 2048 unique combinations for the identification of the source of data or Logger location.

SENTINEL READER/PRINTER ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Sentinel Reader/Printer Assembly	90941

SPECIFICATIONS

Dimensions:
10-1/2 inches in height
9-7/8 inches in width
13-3/4 inches in depth

Temperature Range:
-40° F to +160°F
(-40°C to +70°C)

Application:
Plugs into Data Logger or AC Power Pack

Front Panel Controls:
Permits setting of Julian date and time in the Logger unit, printing of data from the Logger's memory, visual display of the Logger's memory, or printing mechanism test.

Front Panel Display:
Digital readout of time and event status of 11 input lines.

Printout:
Same as front panel display except as printed copy on tape.

Power Required:
12 VDC from the Logger unit or the AC Power Pack (0.6 Amp or 1.0 Amp when printing).

SENTINEL MINILOG

The Minilog is a solid-state memory unit used to gather stored data from a Sentinel Logger memory for later display by a Reader/Printer, in conjunction with an AC Power Pack in an office or similar location. It contains a solid-state memory with a nickel cadmium battery that will retain stored data for approximately 30 days. The Minilog may be equipped with optional 512, 1K, 2K, or 4K event memory capactiy. However, the memory capacity of the Minilog must be equal to or greater than the memory capacity of the Logger unit being recorded.

To acquire data, the Minilog is plugged into the Logger connector. By pressing the record button, data stored in the Logger memory is transferred to the Minilog. The Minilog then can be removed and later inserted in the power pack along with the Reader/Printer for printing. The Minilog is especially useful in adverse weather conditions which may prevent the use of the Reader/Printer in the field.

SENTINEL MINILOG ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Minilog Assembly w/512 event memory	90943-0500
Minilog Assembly w/1K event memory	90943-1000
Minilog Assembly w/2K event memory	90943-2000
Minilog Assembly w/4K event memory	90943-4000

SPECIFICATIONS

Dimensions:
3 inches in height
5-3/8 inches in width
7-3/4 inches in depth

Application:
Plugs into Data Logger for recording and provides print out from Reader/Printer when used with AC Power Pack.

Temperature Range:
32° F to +160°F
(0°C to +70°C)

Power Requirements:
12 VDC from the Logger unit or AC Power Pack; 10 mAmps.

Memory:
Solid-state RAM; 512, 1K, 2K, or 4K event memory.

Front Panel Control:
Record Button

Recording Time:
Less than 4 seconds

SENTINEL AC POWER PACK

An AC Power Pack is available as an office unit which supplies 12 VDC to operate the Reader/Printer from 117 VAC, and the interconnect required to operate and print out information from the Minilog. This unit is also used to recharge the battery in the Minilog.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Sentinel AC Power Pack	90945

BULLETIN NEW PRODUCT

NO. 8-88 DATE 5-18-89

SUBJECT SENTRY PLUS DATA RECORDER, 91015
SENTRY DATA RECORDER, 91010

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FILE NO. 302-5A
119-26

R. V. PEEL

(LIST REVISED 3/22/89)

NEW PRODUCT BULLETIN

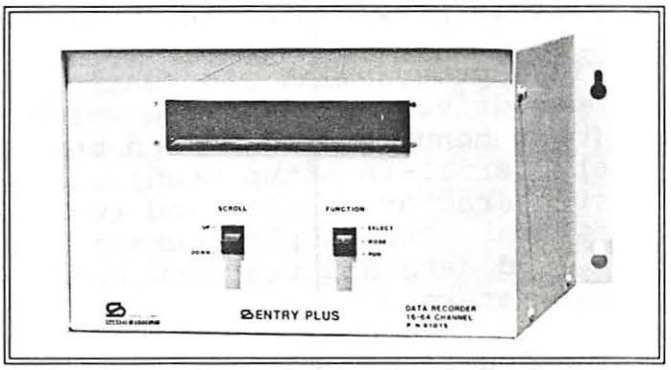
HAWKER SIDDELEY

Safetran Systems

4650 Main Street N.E., Minneapolis, MN 55421 • 612-572-0466 • TWX: 629-13307

SUBJECT: **Sentry Plus Data Recorder, 91015**
Sentry Data Recorder, 91010
CATALOG SECTION: **Signals**

NO: **8-88**
Revised
DATE: **5-18-89**



The Sentry Plus Data Recorder (SDR), 91015, and the Sentry Data Recorder, 91010, are microprocessor-based, digital data recording devices that provide a date and time-coordinated record of events at grade crossings, interlockings, or any location where equipment produces voltage level changes similar to those produced by relay contact closures. The 91010 SDR is a basic recorder unit designed for use in areas with limited recording requirements. This unit can accommodate a maximum of 16 separate parallel inputs (channels) simultaneously. The 91015 SDR is equipped with multiple parallel input ports and a memory expansion capability which enable the unit to monitor up to a maximum of 64 channels simultaneously.

Recorded information, indicating any change of input state (low-to-high, or high-to-low), is stored in solid-state, battery backed-up, RAM (Random Access Memory). When a change of input state occurs on any one of the channels, a date and time-stamped recording is made at that precise moment. RAM in the 91010 SDR is fixed at 64k bytes. RAM in the 91015 SDR is expandable in 256k-byte increments, from the basic 96k bytes (-00 version) up to 864k bytes (-03 version), by installing optional memory expansion modules. Memory capacity is related to the amount of history to be retained and not necessarily to the number of channels being serviced. Battery backup for memory is standard.

Specific recorded data can be searched by time and date of occurrence and displayed on the front panel-mounted, 40-character, alphanumeric display, or transferred to a printer for a permanent record. Event data appearing on the display consists of date and time of occurrence, channel number of the first of 16 channel-status positions displayed (or to be printed), and the channel numbers of all channels in the block of 16 channels with a high input state at the indicated date and time, including those channels experiencing a change of input state (low-to-high only) at that instant. Field programming permits names to be assigned to each channel, and the mile post location of the SDR can also be entered. When a printout is generated, the channel names and the mile post identifier appear on the printout.

Each channel input from a monitored signal circuit consists of two wires attached to screw terminals on a Data Recorder Interface Assembly. All inputs on the interface assembly are electrically isolated from each other and from ground by optical isolators, allowing direct connection to vital circuits. The interface assembly is then attached to the SDR via a 25-conductor, RS-232 cable. Interface assemblies are available in two configurations; basic 16-channel (80025), and 24-channel (80035).

A recessed panel on the side of the SDR contains parallel connectors (one on 91010, three on 91015) for attaching optoisolator interface assemblies, an RS-232 serial printer connector, and a terminal block for 12-volt battery supply. An RS-422 connector is also provided on the 91015 SDR for time slaving of multiple SDR's. The time-slaving feature permits one SDR to be the master time keeper for several SDR's to ensure that all SDR units are set to precisely the same time. A second RS-232 serial port is provided on the 91015 SDR for future applications.

Field programming and control of recorder operation is simplified by the menu-driven SDR software which supports five interrelated menu blocks (main menu, configuration menu, data display menu, printer setup menu, and serial-in setup menu). Operator interface with the SDR is via the 40-character display and two switches; a SCROLL switch and a FUNCTION switch. The display permits the user to view current or previously recorded data and the menu options for controlling and programming system parameters.

The SDR is housed in a brushed aluminum case designed for either shelf or backboard mounting.

SPECIFICATIONS:

Power:	
Voltage	9.5 - 16 VDC
Current	150 mA
Data Inputs:	
Parallel	1 to 64 channels (91015 SDR) 1 to 16 channels (91010 SDR)
Input Resistance	5k ohms — optoisolator interfaces
Input Voltage	8 - 36 VDC — optoisolator interfaces
Serial	1 RS-232 connector (91015 SDR)(for future use)
Time Base:	Crystal controlled; 24-hour, minutes, seconds
Resolution	Minimum 1 second
Stability	Accurate to within 30 seconds per year
Signature	Time & date recorded with each change of input state
Date:	Month/day/year
Operating Temperature:	-40°F to +160°F (-40°C to +71°C)

Dimensions:

Data Recorder, 91015 (91010 specifications in parentheses)	Height: 7-1/2 inches (3 inches) Width: 14-3/8 inches w/mounting tabs Depth: 10-7/8 inches Weight: 7 pounds 11 ounces (5 pounds, approx.)	
Interface Assemblies	80025, 16 channel Height: 1-7/8 inches Width: 9-3/8 inches Depth: 8-3/8 inches Weight: 1 pound	80035, 24 channel Height: 1-7/8 inches Width: 9-3/8 inches Depth: 12-3/4 inches Weight: 1 pound 5 ounces

ORDERING INFORMATION:

To order, specify:

Sentry Data Recorder (non-expandable)
Part Number 91010 (64k bytes of RAM)

Sentry Plus Data Recorder
Part Number 91015-00 (basic 96k bytes of RAM)
Part Number 91015-01 (352k bytes of RAM, includes memory expansion module in slot M1)
Part Number 91015-02 (608k bytes of RAM, includes memory expansion modules in slots M1 and M2)
Part Number 91015-03 (864k bytes of RAM, includes memory expansion modules in slots M1, M2, and M3)

Memory Expansion Module, LPM-UMC2-P-256-ST
Part Number Z927-00122-0000

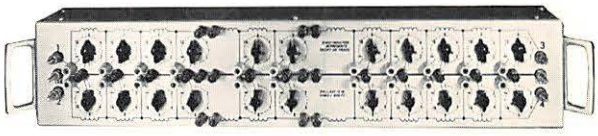
Data Recorder Interface Assembly

Maximum Number Of Channels Serviced	Interface Assembly Part Number	Quantity Required
16	80025	1
24	80035	1
40	80025 80035	1 1
48	80035	2
64	80025 80035	1 2

TEST EQUIPMENT

TRACK SIMULATOR, TRAIN SIMULATOR

Train Simulator



Track Simulator

Safetran's Track Simulator A90903 provides either balanced or unbalanced simulated track configurations for shop testing of Grade Crossing Predictors, Motion Sensors, and similar equipment. Design of the simulator provides very flexible operational setups for either bidirectional or unidirectional track configurations.

Unidirectional operation is available over a range of 1000 to 10,000 feet in the balanced configuration or over a range of 500 to 10,000 feet in the unbalanced configuration.

Bidirectional operation, when both directions of the track are equal in length, is available over a range of 1000 to 5000 feet in the balanced configuration or over a range of 500 to 5000 feet in the unbalanced configuration.

Track ballast in ohms is set by switches. For balanced track simulation, ballast range is 2 to 32 ohms per 1000 feet, or two times the indicated switch settings. For unbalanced track simulation, the ballast range is from 0.5 to 8 ohms per 1000 feet or one-half of indicated switch settings.

Safetran's Train Simulator, A90915, provides simulation of six different train speeds for the following types of equipment: Model 300 GCP, Model 400 GCP, Model 300/350 GCP, Model 500 MS, Model 525 MS, Model 550 MS, Model 585/590 MS, Model 600 MS/GCP, Models 660ND and 660ND2 MS/GCP.

The simulator simulates both ingoing and outgoing trains. The simulator requires 117 VAC for operation and is small enough to be portable for field use.

TRAIN SIMULATOR AND TRACK SIMULATOR SPECIFICATIONS

TRAIN SIMULATOR

Dimensions:

Height: 4-3/4 inches
Width: 11 inches
Depth: 12-1/2 inches

Weight:

11-1/2 pounds

Input Power:

117 VAC

TRACK SIMULATOR

Dimensions:

Height: 6-1/8 inches
Width: 32-1/4 inches
Depth: 7 inches

Weight:

32 pounds

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Train Simulator	A90915
Track Simulator	A90903

NEW PRODUCT BULLETIN

HAWKER SIDDELEY

Safetran Systems

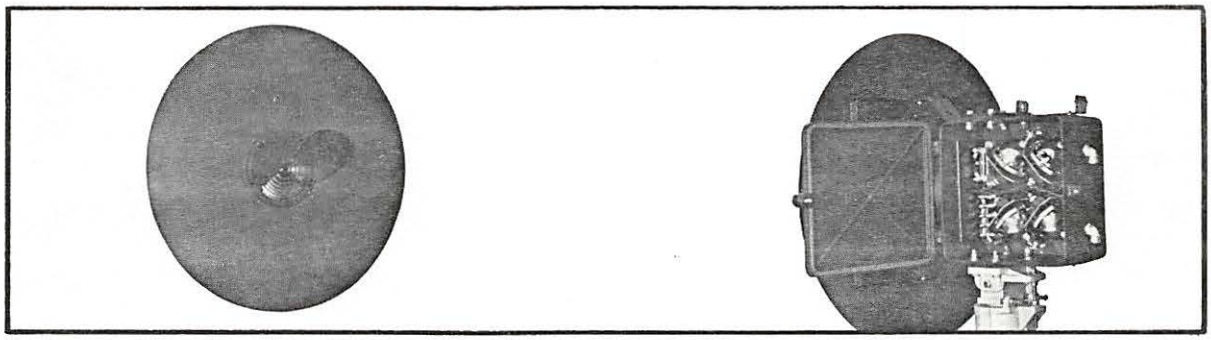
4650 Main Street N.E., Minneapolis, MN 55421 • 612-572-0466 • TWX: 629-13307

SUBJECT: UNILENS II COLOR LIGHT SIGNAL

NO: 9-89

CATALOG SECTION: SIGNAL

DATE: 9-11-89



The UNILENS II is a railroad wayside color light signal capable of providing up to four different color indications with a single lens. Light transmission from individual lamp-filter modules is carried in a fiberoptic conductor to the common output lens.

Light output, circuiting and operation are the same as a conventional color light signal, yet size is near that of a single color light module or searchlight signal. It is available with 8" lens or in a 6" lens limited clearance version for dwarf or transit use. Either may be directly stacked with other UNILENS II or Safetran CLS 10D heads to provide multiple arm signals.

The UNILENS II is smaller and lighter than most any other signal providing two or more aspects for ease in installation. A sighting scope is provided for beam alignment. The housing is reversible for installation as either a right or left hand signal. Housing and background are aluminum.

Specifications:

Aspect colors: Green, Yellow, Red, Lunar White
Number of Aspects: Three or Four
Lens: 8-3/8" or 6-3/8", plain or 40 degree center
Lamp Bulb: 18-25 watt, 10 volt, S-11, sc bayonet signal lamp
Housing: Cast Aluminum, flat black painted
Mounting: Top of mast, side of mast or dwarf base
Background & Visor: Sheet aluminum, flat black paint (for 8" lens unit only)
Aiming Device: Two way adjustable base, peep sight scope
Circuit connection: Same as color light
Voltage adjustment: Resistor in lamp head; optional transformers with taps for 115 VAC lighting
Dimensions: (6" lens signal) 24" H, 8-1/2" W, 24" D
(8" lens signal) 27" H, 8-1/2" W, 26" D
Weight: 53 pounds (6" Lens Model) 73 Pounds (8" Lens Model)

Ordering References:

To Order Specify:
Unilens II Color Light Signal Model IW-20 (8") or
Unilens II Color Light Signal Model IW-20RT (6") and:
Number and color of aspects, lamp wattage; plain or 40 degree center; top, side, or dwarf base; single or stacked signal (provide sketch if stacked)

Safetran

STANDBY FLASHER SSCC

MODEL A91155

- **CHANGES NON-FLASH FUNCTION TO FLASHING**
- **NO ADDITIONAL LAMP VOLTAGE ADJUSTMENT**
- **TESTED TO SEVERAL MILLION FLASHES**

Safetran's Solid State Crossing Controller (SSCC) contains a unique patented wraparound feature that generally prevents an SSCC module failure from activating the crossing warning system unless a train is actually present. This feature provides a great deal of credibility to the crossing operation. When an SSCC is in failure and a train move occurs, the flasher signals are activated and deactivated at the correct times, but the public observes that the signals are on steady instead of flashing.

To provide an alternative failure mode for the flasher signals, Safetran has designed the Standby Flasher unit, A91155. The Standby Flasher changes the non-flash function to flashing during an SSCC module failure. The unit can be added externally to any 20 or 40 ampere SSCC. AREMA recommended terminals on the unit allow it to be easily connected to existing SSCC front panel terminals. Also, no additional lamp voltage adjustment is required. The Standby Flasher unit is powered up when the flasher signals are activated, but does not operate or provide lamp current unless the SSCC is in failure (SSCC vital relay is de-energized). The Standby Flasher unit has been life tested to several million flashes.

A "typical" Standby Flasher installation is illustrated on page 2. Please consult the Standby Flasher Instruction and Maintenance manual for additional information.

SPECIFICATIONS

Power:	Supplied via the SSCC BATTERY CHARGER OUTPUT B and N terminals.
Surge Protection:	Secondary surge protection is provided internally.
Operating Temperature:	-40° F to +160° F (-40° C to +70° C)
Humidity:	95%, non-condensing
Dimensions:	6.0 inches (15.24 centimeters) high 7.0 inches (17.78 centimeters) wide 1.75 inches (4.45 centimeters) deep
Weight:	2 pounds (0.9 kilograms) (approximate)

ORDERING INFORMATION

To order: Specify Standby Flasher SSCC part number 9000-91155-0001

Section C

Safetran

WAYSIDE SIGNALS

SECTION C

CONTENTS

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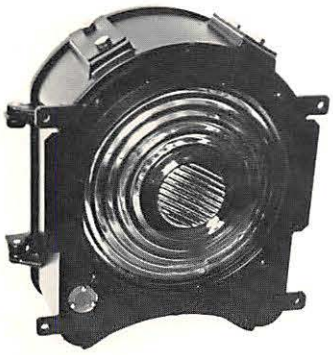
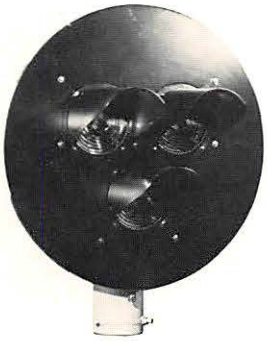
Safetran

COLOR LIGHT SIGNALS

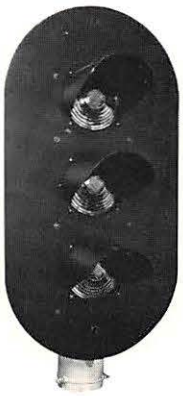
MODELS CLS-20/V-20



CLS-20



V-20



CLS-20
Stacked

- **CONFIGURABLE AS "V" OR VERTICAL COLORLIGHT**
- **EXCELLENT LONG RANGE INDICATION**
- **LIGHTWEIGHT ALUMINUM CONSTRUCTION**
- **PREFOCUSED LENS AND LAMP RECEPTACLES**

The new CLS-20 and V-20 are colorlight signals which feature a new design using modules that can be configured either as a vertical colorlight signal (CLS-20) or a "V" color light signal (V-20). The new precision die cast aluminum housing has been reduced in weight as compared to Safetran's CLS-10 Color Light Signal, yet will still accommodate a full size AAR terminal block, resistor or transformer. The formerly separate lens housing is now integral with the main housing.

The CLS-20/V-20 doublet lens arrangement is the standard 8-3/8" x 5-1/2" provided in precision-molded acrylic or polycarbonate plastic with ultraviolet inhibitor for long life, clarity and color stability. A neoprene lens gasket is used. An anti-phantom screen is available.

A new die cast aluminum bulb support bracket and molded polycarbonate slide allows for faster and easier bulb focus adjustment. The CLS-20/V-20 signals also feature a new mounting bracket with a ball-joint design, along with an optional junction box. This design allows for greater ease in field alignment. The precision die cast construction provides for greater consistency in module-to-module alignment.

Backgrounds and visors are available for the CLS-20 and V-20 in etched aluminum with black paint to avoid the problems of rusting and weathering. Backgrounds and visors are also available in steel and plastic.

ORDERING INFORMATION

To order, specify the following:

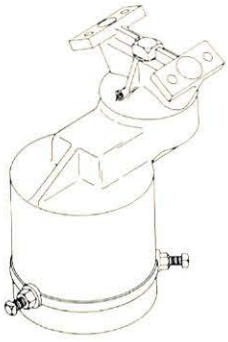
1. Model CLS-20 Color Light Signal from table below:

Description	Part Number
CLS-20 standard 3-unit head	044000-15X
CLS-20 3-unit head (115 VAC)	044000-16X
CLS-20 standard 2-unit head	044000-17X
CLS-20 2-unit head (115 VAC)	044000-18X
CLS-20 standard single-unit head	044000-19X
CLS-20 single-unit head (115 VAC)	044000-20X
V-20 standard unit	044300-X
V-20 (115 VAC)	044300-5X

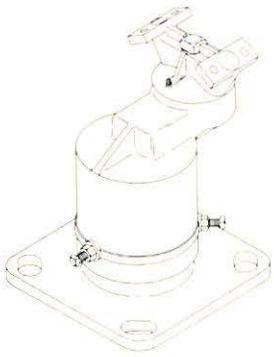
2. Lenses desired, see page C-1-3
3. Bulb type, see page A-7-4
4. Background and Visor, see page C-1-4
5. Mounting desired, see section C-1-2 and C-1-3

MOUNTING BRACKETS

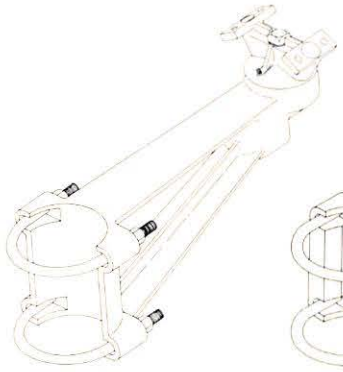
Mounting brackets are of lightweight, cast aluminum construction. The mounting base assembly is to be used for 8 x 8-inch bolt spacing for dwarf or bridge mounting.



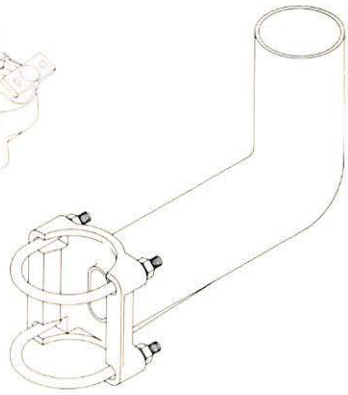
Top of Mast Mounting



Mounting Base 8" x 8" Bolt Spacing



Side or Front of Mast Mounting (external wiring)



Side or Front of Mast Mounting (internal wiring) See Note

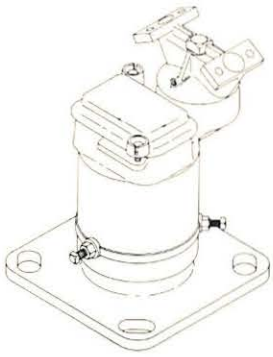
Description	Part Number
Mounting Bracket, top of 5" mast	044011-X
Mounting Bracket, top of 4" mast	044011-1X
Mounting Bracket, side/front of 5" mast	044013-X
Mounting Bracket, side/front of 4" mast	044013-3X
Mounting Bracket, side/front of 5" mast — tube type	042256-4X
Mounting Bracket, back to back 5" mast — tube type	042256-6X
Dwarf Mounting Base	044027-X

NOTE: Top of mast mounting bracket 044011-X must be ordered when using the internal wiring (tube type) side/front of mast mounting bracket.

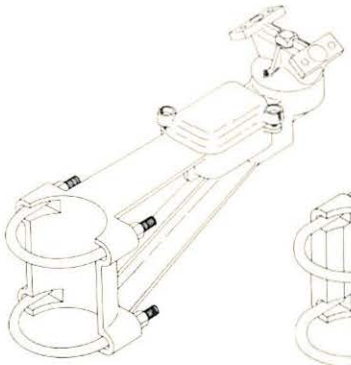
MOUNTING BRACKETS WITH TERMINAL BOX

Mounting brackets are of lightweight, cast aluminum construction. The mounting base assembly is to be used for 8 x 8-inch bolt spacing for dwarf or bridge mounting.

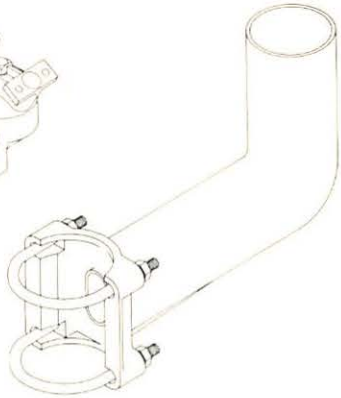
Top of Mast Mounting



Mounting Base 8" x 8" Bolt Spacing



Side or Front of Mast Mounting (external wiring)



Side or Front of Mast Mounting (internal wiring) See Note

Description	Part Number
Mounting Bracket, top of 5" mast	044013-4X
Mounting Bracket, top of 4" mast	044013-17X
Mounting Bracket, side/front of 5" mast	044013-8X
Mounting Bracket, side/front of 4" mast	044013-16X
Mounting Bracket, side/front of 5" mast — tube type	042256-4X
Mounting Bracket, back to back 5" mast — tube type	042256-6X
Dwarf Mounting Base	044027-1X

NOTE: Top of mast mounting bracket 044013-4X must be ordered when using the internal wiring (tube type) side/front of mast mounting bracket.

LENSES FOR THE MODEL CLS-20 COLOR LIGHT

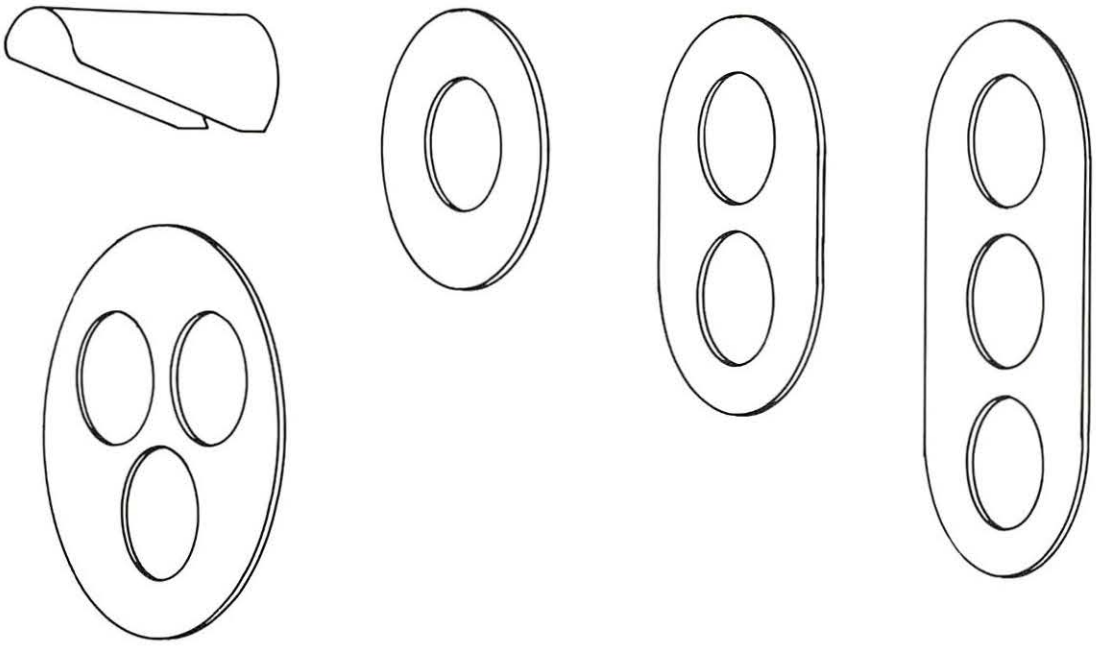
Lenses for the Model CLS-20 Color Light Signal are available in glass or high impact plastic. Both lens types provide a full face high intensity indication light. These lenses meet or exceed applicable AAR specifications.

Diameter	Focal Length	Deflection	Color	Material	Part Number	Application
5-1/2"	1/2"	None	Green	Glass	042257-1G	Inner Doublet
5-1/2"	1/2"	None	Green	Plastic	042257-4G	Inner Doublet
5-1/2"	1/2"	None	Lunar	Glass	042257-1L	Inner Doublet
5-1/2"	1/2"	None	Lunar	Plastic	042257-4L	Inner Doublet
5-1/2"	1/2"	None	Red	Glass	042257-1R	Inner Doublet
5-1/2"	1/2"	None	Red	Plastic	042257-4R	Inner Doublet
5-1/2"	1/2"	None	Yellow	Glass	042257-1Y	Inner Doublet
5-1/2"	1/2"	None	Yellow	Plastic	042257-4Y	Inner Doublet
8-3/8"	4"	None	Clear	Glass	042257-10	Outer Doublet
8-3/8"	4"	None	Clear	Plastic	042257-5	Outer Doublet
8-3/8"	4"	40° Deflecting Centerspot	Clear	Glass	042257-2	Outer Doublet
8-3/8"	4"	40° Deflecting Centerspot	Clear	Plastic	042257-6	Outer Doublet
8-3/8"	None	20°Deflecting	Clear	Plastic	042257-8	Roundel
8-3/8"	None	10° Deflecting	Clear	Plastic	042295-7	Roundel

NOTE: To adapt signal to curved track, order inner doublet of your choice, outer doublet #042257-5, Roundel #042257-8, and lens ring #044023.

BACKGROUNDS AND VISORS

Backgrounds and visors are available in steel or aluminum painted non-reflecting black or high density polyethylene plastic. Backgrounds and visor assemblies listed below include all necessary mounting hardware.



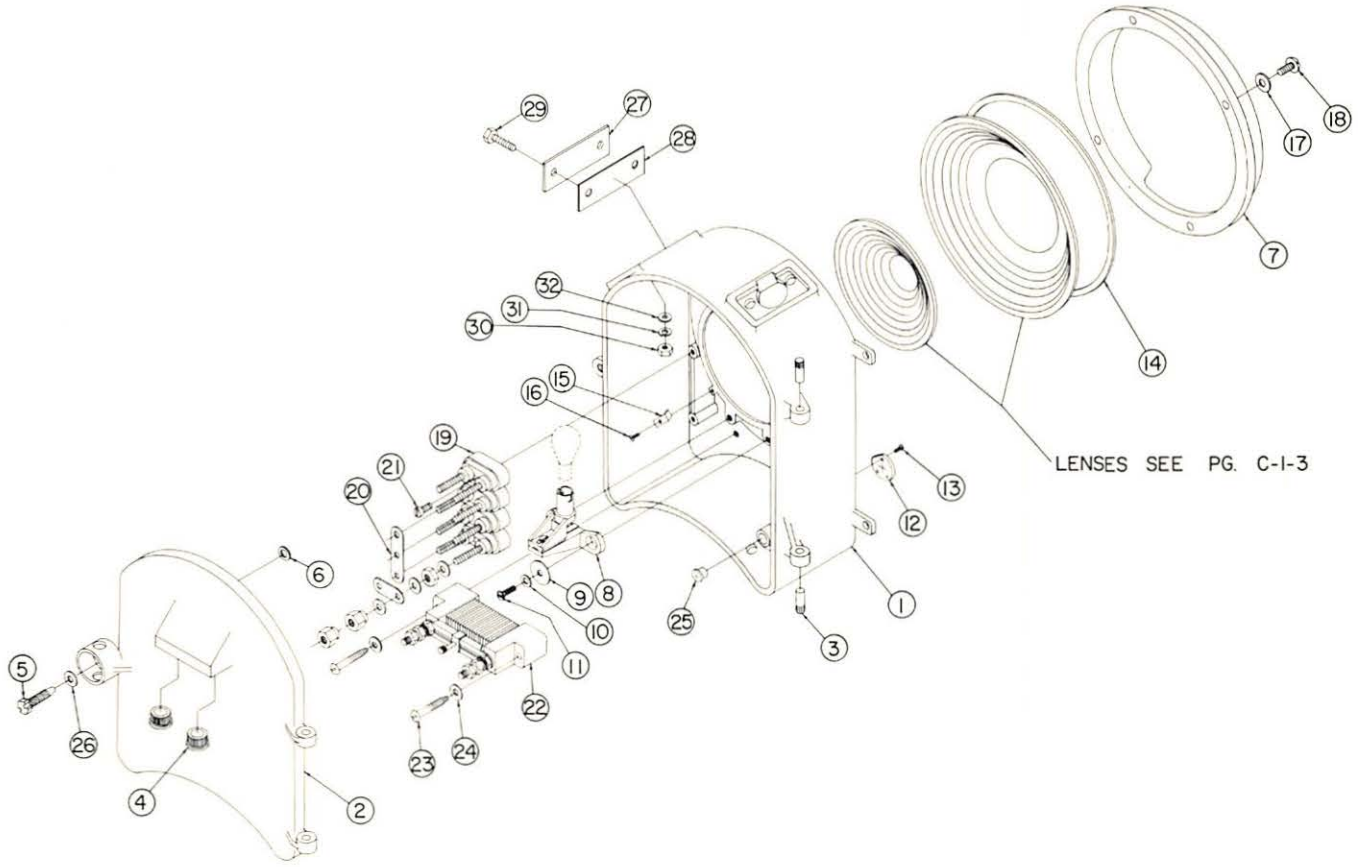
Description	Part Number		
	Steel	Plastic	Aluminum
Visor	042005-1X	042005-3AX	044018-X
Background for 3-unit CLS-20	044019-2X	044019-1X	044019-X
Background for 2-unit CLS-20	044020-2X	044020-1X	044020-X
Background for single unit CLS-20	044021-2X	044021-1X	044021-X
Background for V-20	044022-3X	044022-5X	044022-4X

ACCESSORIES

Description	Part Number
Anti-Phantom Screen	042258-2
Blank Cover Plate	044030
Lock Rod, 3 unit CLS-20	044036
Lock Rod, 2 unit CLS-20	044036-1
Alignment Sight Kit CLS-20/V-20*	044006-X

NOTE: *Kit includes: (1) Alignment Plug; (2) Sight Lens; (3) three each #6 x 1/4 self tapping screws.

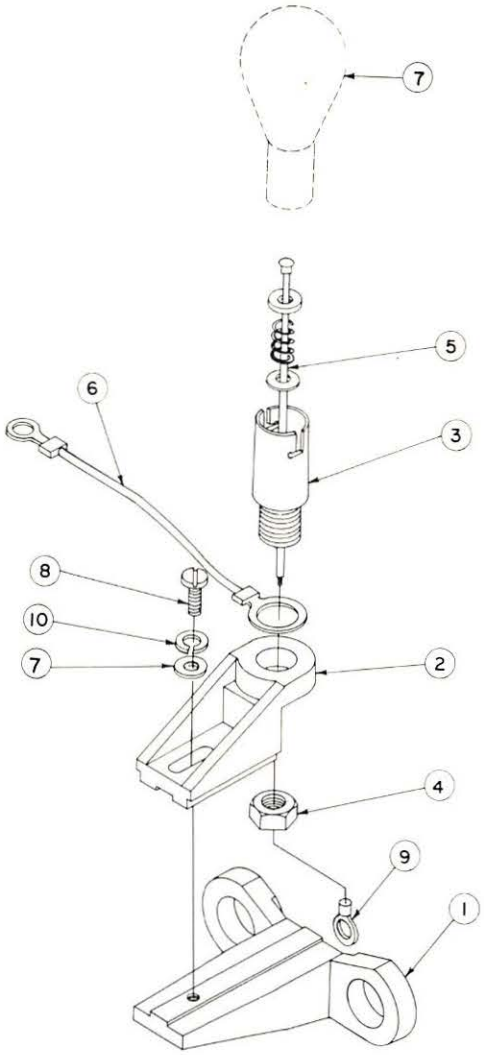
CLS-20 COLOR LIGHT SIGNAL REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Housing, Die Cast	1	044001	17	W-LKS, #10	4	1806-MEJ
2	Door, Die Cast	1	044002	18	MS-RH, 10-24x5/8	4	2594-REJ
3	Pin, Hinge	2	044015	19	Terminal Block Assembly	4	023274-26X
4	Screen, Bushing, Vent Ass'y.	2	041913-X	20	Connector, Buss	3	023839-2
5	Screw, Hex Locking	1	042056	21	1/4-20 x 5/8 FIL	2	2659-LE
6	O-Ring	1	042380	22	Resistor, Adj, 5 Ohm Max.	1	029603-2X
7	Ring, Lens & Visor Mtg.	1	044003	23	10-24 x 1-1/2 RHMs	2	2600-RSC
8	Lamp Support Assembly	1	044004-X	24	Washer, Flat #10	2	1712-SC
9	Spacer, Alum.	2	042957	25	Aligning Plug	1	042360-3
10	Washer, Spring 1/4	2	1981	26	W-CU, 3/4 x 11/32	1	1722-C
11	1/4-20 x 3/4 PHMS	2	2660-PE	27	Cover Plate	2	044008
12	Lens, Aligning	1	044006	28	Gasket	4	044009
13	#4 x 1/4 Drive Screw	3	5166-URSC	29	5/16-18-1-1/4 HEX HD	4	4047-HSC
14	Gasket, Lens	1	044014	30	5/16-18 HEX NUT	8	2102-SC
15	Clip, Lens	3	042026-7	31	5/16 Lockwasher	8	1809-MSC
16	10-24 x 3/8 Truss	3	2590-TE	32	5/16 Flatwasher	12	1724-SC

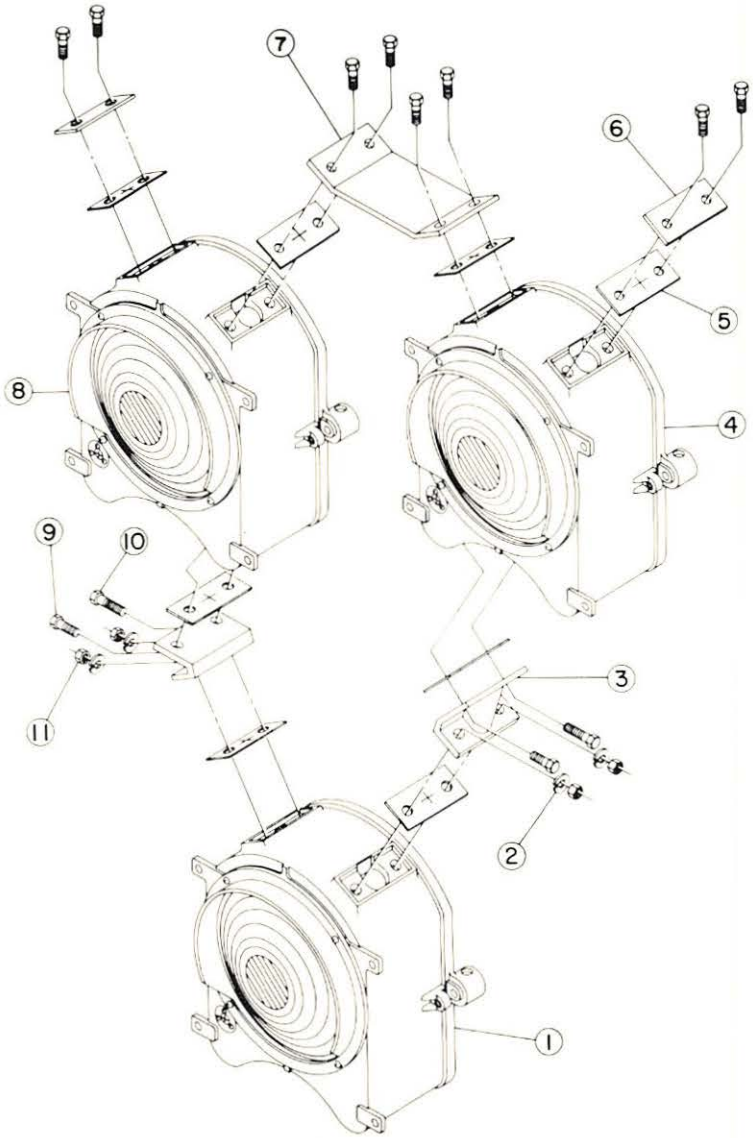
LAMP SUPPORT BRACKET REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Quantity Req'd.	Part Number
1	Post, Lampholder	1	044004
2	Slide, Lampholder	1	044005
3	Socket, Bulb	1	042019-6
4	Nut, 7/16-20	1	2350-SC
5	Wire Assembly	1	042021-3X
6	Wire, 16 Ga. Ass'y.	1	042356-2X
7	Lamp Bulb, See page A-7-4	1	Specify
8	Washer, Wrought #8	1	1709-SC
9	Terminal, 1/4 post	1	024628-110
10	Screw, 10-32 x .5	1	2616-PE
11	Washer, Spring #10	1	1979

MODEL V-20
REPLACEMENT PARTS



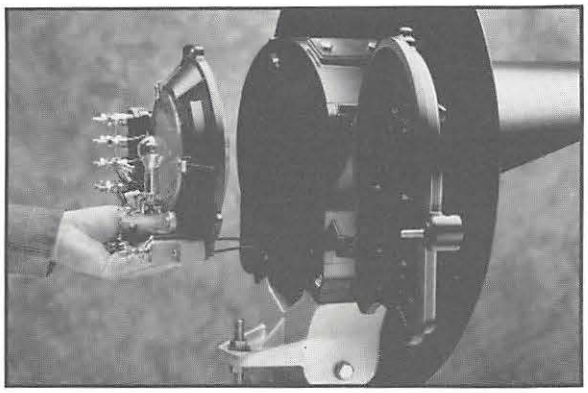
To Order: Specify Description and Part Number.

Item No.	Description	Quantity Req'd	Part No.
1	Bottom Unit Assembly	1	044000-X
2	5/16 Lock Washer	24	1809-MSC
3	Support Foot Upright	2	044000-2
4	Upper Right Assembly	1	044000-7X
5	Gasket	12	044009
6	Cover Plate	4	044008
7	Bracket Support	1	044010-1
8	Upper Left Assembly	1	044000-6X
9	5/16 18-1¼ Hex Head	8	4047-HSC
10	5/16 18 -1-½ Hex Head	8	4048-HSC
11	5/16 - 18 Hex Nut	24	2102-SC

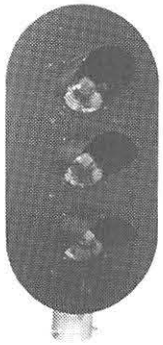
Safetran

COLOR LIGHT SIGNALS

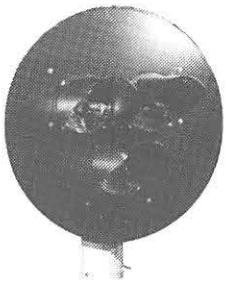
MODELS CLS-20R/V-20R



- **HIGH EFFICIENCY LENSES FOR IMPROVED LIGHT OUTPUT**
- **LIGHTWEIGHT PRECISION DIE-CAST ALUMINUM CONSTRUCTION**
- **PREFOCUSED LENS AND LAMP RECEPTACLES**



CLS-20R Stacked



V-20R

Safetran's CLS-20 and V-20 color light signals have been improved with a rear-serviceable optical module which includes both inner and outer doublet lenses, as well as the prefocused lamp and socket, and now called CLS-20R and V-20R. Both outer and inner lenses can be inspected, cleaned or replaced without going around to the front of the signal. The background and visor remain in place on the signal housing so the optical module is small, light in weight and easily handled.

The optical module assembly is built with a precision die cast aluminum body and lamp mounting. This assures that the optics will remain rigidly aligned during servicing and light output will be maintained.

Doors are interlocked to prevent opening any door that may give less restrictive indication from light entering an open door. This maintains the convenience of individual doors without the possibility of displaying an improper aspect during servicing.

The outer housing is black painted precision die cast aluminum and provides space for AAR post type terminal blocks, resistors or transformers. Both stacked and "V" signals use the same heads for convenient in-shop servicing or if signal layout plans change. Backgrounds and visors are normally supplied in etched aluminum with flat black paint to minimize maintenance. They are available in black painted steel or plastic as well.

ORDERING INFORMATION

To Order: Specify the Following

1. Model CLS-20R Color Light Signal from table below:

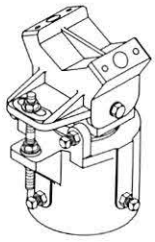
Description	Part Number
CLS-20R standard 3-unit head	044000-15RX
CLS-20R 3-unit head (115 VAC)	044000-16RX
CLS-20R standard 2-unit head	044000-17RX
CLS-20R 2-unit head (115 VAC)	044000-18RX
CLS-20R standard single-unit head	044000-19RX
CLS-20R single-unit head (115 VAC)	044000-20RX
V-20R standard unit	044300-RX
V-20R (110 VAC)	044300-5RX

2. Lenses desired, see page C-1-3.
3. Bulb type, see page A-7-4 of Safetran Signal Catalog.
4. Background and Visor, see page C-1-4.
5. Mounting desired, see below.

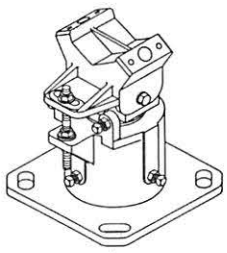
MOUNTING BRACKETS

(STANDARDALIGNINGADJUSTMENT)

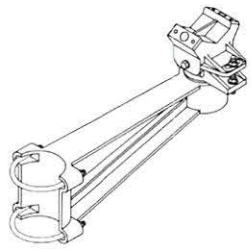
Mounting brackets are of lightweight cast aluminum construction. The mounting base assembly is to be used for 8 x 8 inch bolt spacing for dwarf or bridge mounting.



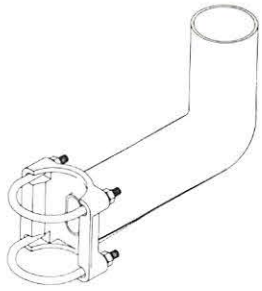
Top of Mast Mounting



Mounting Base 8" x 8" Bolt Spacing



Side or Front of Mast Mounting (external wiring)



Side or Front of Mast Mounting (internal wiring) See Note

Description	Part Number
Mounting Bracket, top of 5" mast	044011-4X
Mounting Bracket, top of 4" mast	044011-5X
Mounting Bracket, side/front of 5" mast	044013-27X
Mounting Bracket, side/front of 4" mast	044013-28X
Mounting Bracket, side/front of 5" mast - tube type	042256-4X
Mounting Bracket, back to back 5" mast - tube type	042256-6X
Dwarf Mounting Base	044027-2X

Note: Top of mast mounting bracket must be ordered when using the internal wiring (tube type) side/front of mast mounting bracket.

LENSES FOR THE MODEL CLS-20R COLOR LIGHT

The signal uses Safetran's new high efficiency 8-3/8" x 4" f.l. outer lens and 5-1/2" x 1/2" f.l. inner lens for maximum light output. The outer lens is polycarbonate with ultraviolet light inhibitor for high strength and long life and inner lens is optical quality acrylic with accurate, highly stable color. All standard doublet color light signal lenses may also be used. Antiphantom screens are available and the high intensity lenses provide improved light transmission to overcome the loss from the screen. This provides an improved light output even with an antiphantom screen in place.

To Order: Specify the Following

Diameter	Focal Length	Deflection	Color	Material	Part Number	Application
5-1/2"	1/2"	None	Green	Plastic	044050-G	Inner Doublet*
5-1/2"	1/2"	None	Red	Plastic	044050-R	Inner Doublet*
5-1/2"	1/2"	None	Yellow	Plastic	044050-Y	Inner Doublet*
5-1/2"	1/2"	None	Lunar	Plastic	042257-4L	Inner Doublet
8-3/8"	4"	40° Center	Clear	Plastic	044054-40	Outer Doublet*
8-3/8"	4"	None	Clear	Plastic	044054	Outer Doublet*
8-3/8"	None	15° Deflecting	Clear	Plastic	042295-7	Roundel**

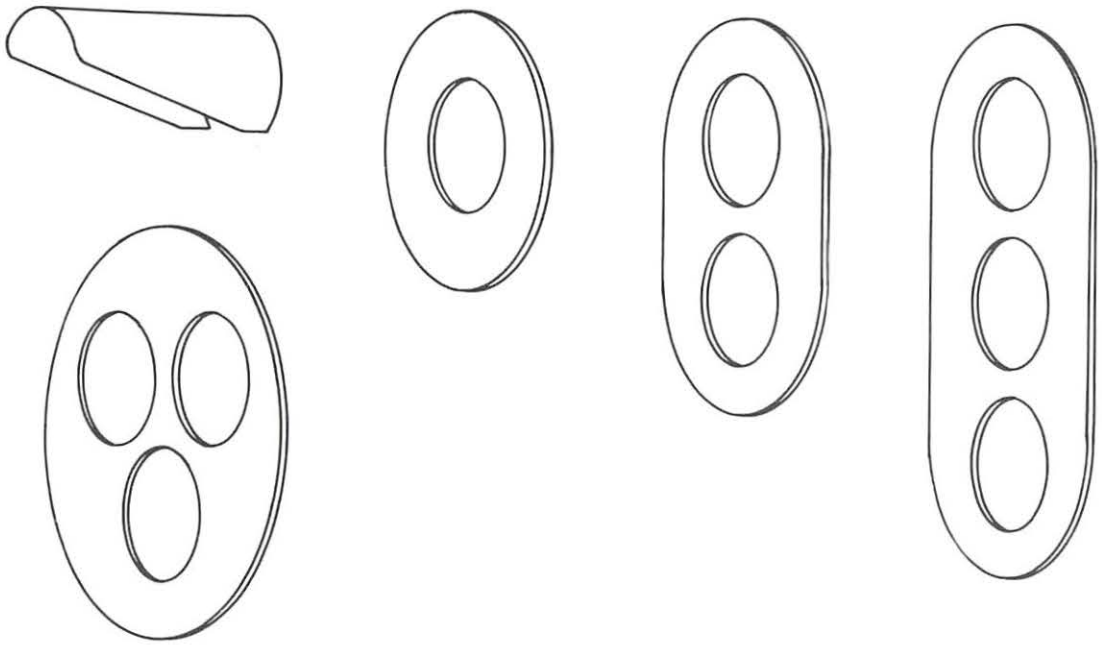
* New High Efficiency lenses

** The 15° deflecting roundel for curved track application is mounted over the standard lens internally between the housing and optical module, using an adapter ring. Specify "with deflecting roundel" when ordering.

Note: For field installation, order Roundel/Adapter Kit 044606-X.

BACKGROUNDS AND VISORS

Backgrounds and visors are available in steel or aluminum painted, non-reflecting black or high density polyethylene plastic. Backgrounds and visor assemblies listed below include all necessary mounting hardware.

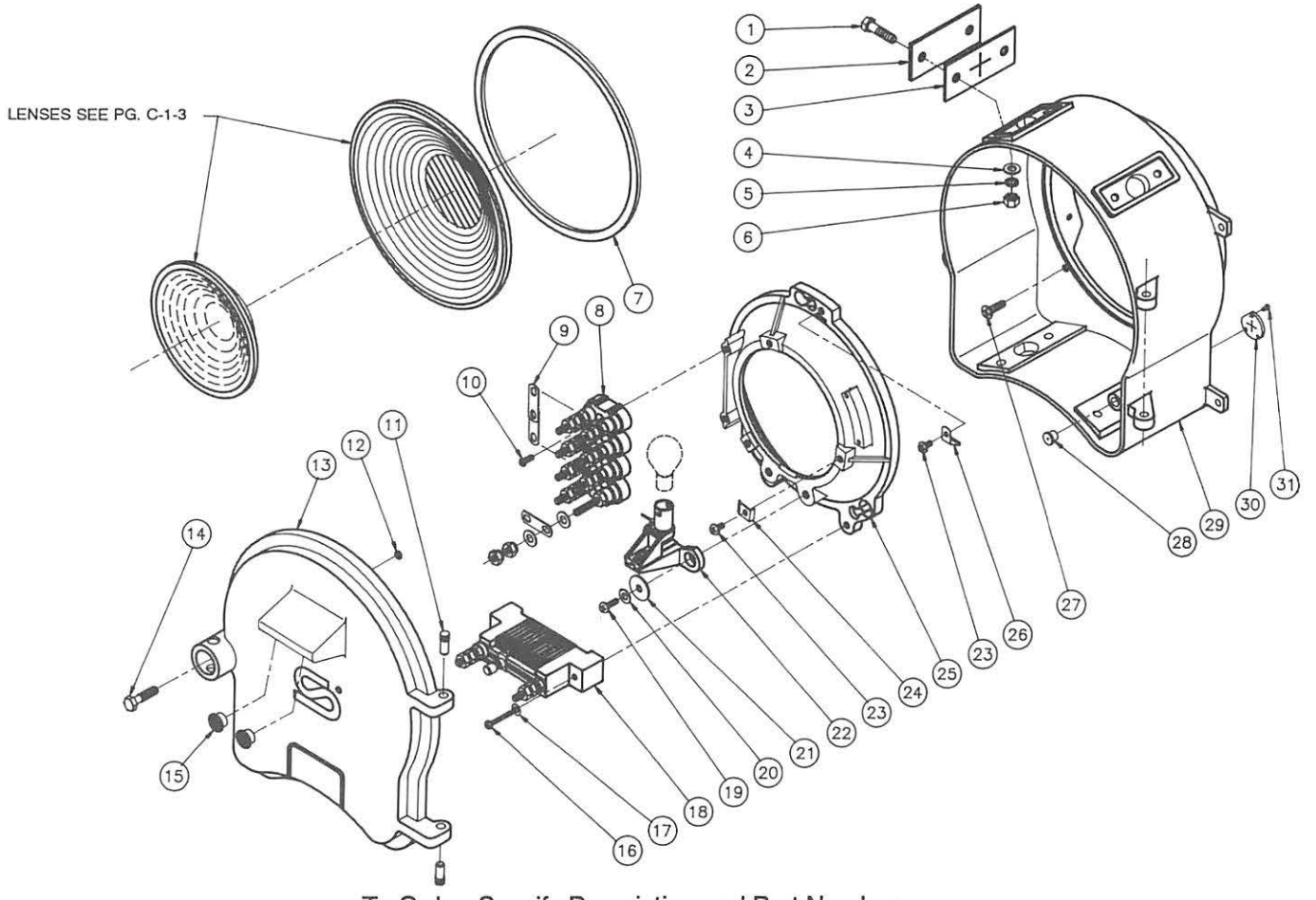


Description	Part Number		
	Steel	Plastic	Aluminum
Visor	042005-1X	042005-3AX	044018-X
Background for 3-unit CLS-20R	044019-2X	044019-1X	044019-X
Background for 2-unit CLS-20R	044020-2X	044020-1X	044020-X
Background for single unit CLS-20R	044021-2X	044021-1X	044021-X
Backgound for V-20R	044022-2X	044022-1X	044022-X

ACCESSORIES

Description	Part Number
Anti-Phantom Screen	042258-2
Blank Cover Plate	044607
Lock Rod, 3 unit CLS-20	044036
Lock Rod, 2 unit CLS-20	044036-2

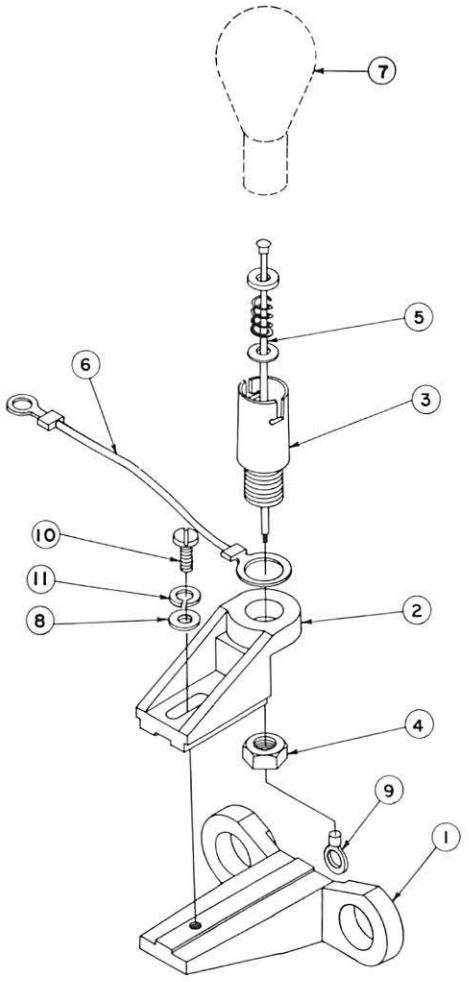
CLS-20R COLOR LIGHT SIGNAL REPLACEMENT PARTS



To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd	Part Number	Item No.	Description	Qty. Req'd	Part Number
1	CS.HH 5/16-18 X 1.25	4	4047-HSC	17	W.FL #10	2	1712-SC
2	Plate, Cover	2	044008	18	Resistor Assy. Adj (2 Ohm)	1	029602-6X
3	Gasket	2	044009	19	MS.PH 1/4-20 x .625 PHIL	2	2659-PEX
4	W.FL 5/16 x 7/8 OD	4	1752-C	20	W.SPG LKS 1/4	2	1981
5	W.LKS 5/16 MED	4	1809-MSC	21	Washer, Special	2	042957
6	N.HX 5/16-18	4	2102-SC	22	Support Assy, Lamp	1	044004-X
7	Gasket, Lens	1	044605	23	MS.TR 10-32 x .375 PHIL	4	2614-TEX
8	Block, Terminal	4	023274-26X	24	Clip, Lens	3	042026-7
9	Connector, Buss	3	023839-2	25	Lens Bracket	1	044603
10	MS.PH 10-32 x .625 PHIL	2	2618-PEX	26	Spring Cup	1	044604
11	Hinge Pin	2	044015	27	1/4-20 x 7/8 Oval Hd Ms	3	2661-OEX
12	O-Ring	1	042380	28	Aligning Plug	1	042360-3
13	Door	1	044601	29	Housing	1	044602
14	Locking Screw	1	042056	30	Sight Lens	1	044006
15	Ventilator	2	040506-1	31	Plate, Sight Hole Cover	1	044007
16	MS.PH 10-32 x 1.50 PHIL	2	2624-PSCX	32	Drive Screw	3	5166-URSC

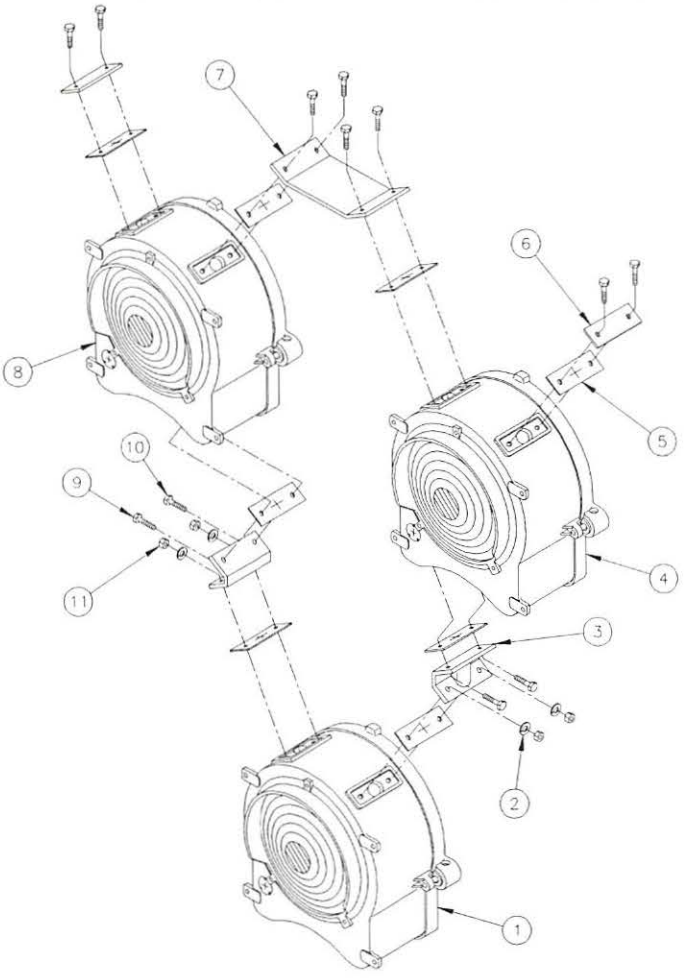
LAMP SUPPORT BRACKET REPLACEMENT PARTS



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number
1	Post, Lampholder	1	044004
2	Slide, Lampholder	1	044005
3	Socket, Bulb	1	042019-6
4	Nut, 7/16-20	1	2350-SC
5	Wire Assembly	1	042021-3X
6	Wire, 16 Ga. Assy.	1	042356-2X
7	Lamp Bulb, See Page A-7-4	1	Specify
8	Washer, Wrought #8	1	1709-SC
9	Terminal, 1/4 post	1	024628-110
10	Screw, 10-32 x .625	1	2618-PEX
11	Washer, Spring #10	1	1979

MODEL V-20R
REPLACEMENT PARTS



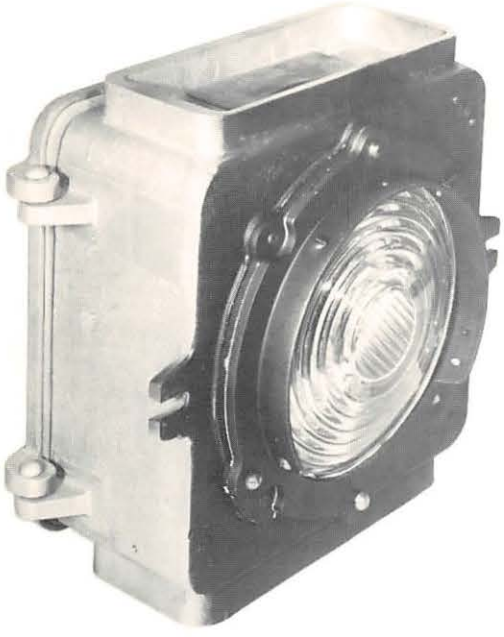
To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd	Part Number
1	Bottom Unit Assembly	1	044000-X
2	5/16 Lock Washer	24	1809-MSC
3	Support Foot Upright	2	044010-2
4	Upper Right Assembly	1	044000-7X
5	Gasket	12	044009
6	Cover Plate	4	044008
7	Bracket Support	1	044010-1
8	Upper Left Assembly	1	044000-6X
9	5/16 - 18-1 Hex Head	8	4047-HSC
10	5/16 - 18-1 Hex Head	8	4048-HSC
11	5/16 - 18 Hex Nut	24	2102-SC

Safetran

DWARF COLOR LIGHT SIGNAL

MODEL CLS-10D



- EXCELLENT LONG RANGE INDICATION
- LIGHTWEIGHT ALUMINUM CONSTRUCTION
- PREFOCUSED LENS AND LAMP RECEPTACLES
- TOP, FRONT OR SIDE, AND BASE MOUNTING

The Model CLS-10D is a long range Dwarf Color Light Signal of modular design, which allows 2, 3, or more units to be easily stacked together.

The housing, doors, and mounting brackets are of lightweight cast aluminum construction.

Neoprene door packing provides a weathertight seal between door and housing. A locking screw secures the hinged door to the lamp housing and utilizes a standard terminal wrench or spanner key to open or close. Additional security may be provided by using a padlock to prevent access to lock screw.

Each lamp has a doublet lens combination which produces an aspect of one color. Ventilation is provided to minimize condensation. The CLS-10D is furnished with optical arrangements for tangent track. Antiphantom screens are also available. The outer doublet and inner colored doublet are 6-3/8 and 5-1/2 inches in diameter respectively. The doublet lens combination, with single contact candelabra, 2 pin, bayonet base lamp, is prefocused and factory sealed to assure maximum light output. The only adjustment necessary is field alignment accomplished through the use of built-in sighting device.

A 5 ohm, 1.73 ampere, adjustable lamp resistor is provided for each lamp.

The mounting arrangements available for the CLS-10D are top of mast mounting, side of wall mounting, or base mounting on 8 x 8 inch bolt spacing, or 6-3/4 x 6-3/4 inch bolt spacing. Mounting bracket assemblies are adjustable for both vertical and horizontal alignment.

Visors may be furnished in either black, high density, polyethylene plastic or steel painted non-reflecting black.

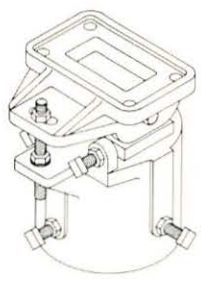
ORDERING INFORMATION

To Order: Specify the following:

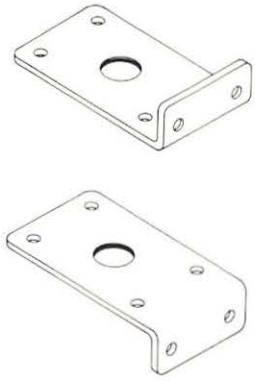
1. Model CLS-10D Dwarf Color Light Signal
2. Number of units and color indication (top to bottom)
3. Lenses desired, see page C-2-3
4. Bulb type, see page A-7-4
5. Mounting desired, see table below
6. Visor, see page C-2-3

MOUNTING BRACKETS

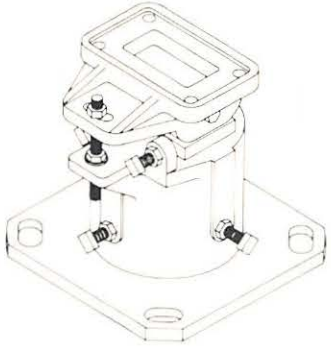
Mounting brackets are of lightweight cast aluminum construction. The top of mast mounting bracket will be furnished for 5 inch pipe mast mounting unless otherwise specified. The mounting base assemblies are to be used for 6-3/4 x 6-3/4 and 8 x 8 inch bolt spacings.



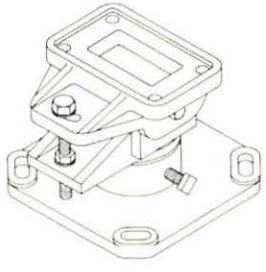
Top of Mast Mounting



Side of Wall Mounting



Mounting Base 8" x 8" Bolt Spacing



Mounting Base 6-3/4" x 6-3/4" Bolt Spacing

To Order: Specify Description and Part Number.

Description	Part Number
Top of Mast Mounting Bracket, 5"	042254-2X
Side of Wall Mounting Bracket	042316-X
Mounting Base for 8" x 8" Bolt Spacing	042275-3X
Mounting Base for 6-3/4" Bolt Spacing	042275-1X

LENSES FOR THE MODEL CLS-10D DWARF COLOR LIGHT SIGNAL

Lenses for the Model CLS-10D Color Light Signal are available in glass or high impact plastic. Both lens types provide a full face high intensity indication light. These lenses meet or exceed applicable AAR specifications.

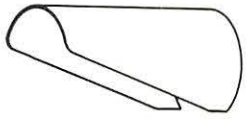
To Order: Specify Diameter, Focal Length, Deflection, Color, Material, and Part Number.

Diameter	Focal Length	Deflection	Color	Material	Part Number	Application
5-1/2"	1/2"	None	Green	Glass	042257-1G	Inner Doublet
5-1/2"	1/2"	None	Green	Plastic	042257-4G	Inner Doublet
5-1/2"	1/2"	None	Lunar	Glass	042257-1L	Inner Doublet
5-1/2"	1/2"	None	Lunar	Plastic	042257-4L	Inner Doublet
5-1/2"	1/2"	None	Red	Glass	042257-1R	Inner Doublet
5-1/2"	1/2"	None	Red	Plastic	042257-4R	Inner Doublet
5-1/2"	1/2"	None	Yellow	Glass	042257-1Y	Inner Doublet
5-1/2"	1/2"	None	Yellow	Plastic	042257-4Y	Inner Doublet
6-3/8"	3-3/4"	None	Clear	Plastic	042210	Outer Doublet
6-3/8"	3-3/4"	40° Deflecting Centerspot	Clear	Plastic	042210-1	Outer Doublet
6-3/8"	3-3/4"	None	Clear	Glass	042210-2	Outer Doublet
6-3/8"	3-3/4"	40° Deflecting Centerspot	Clear	Glass	042210-3	Outer Doublet

VISORS

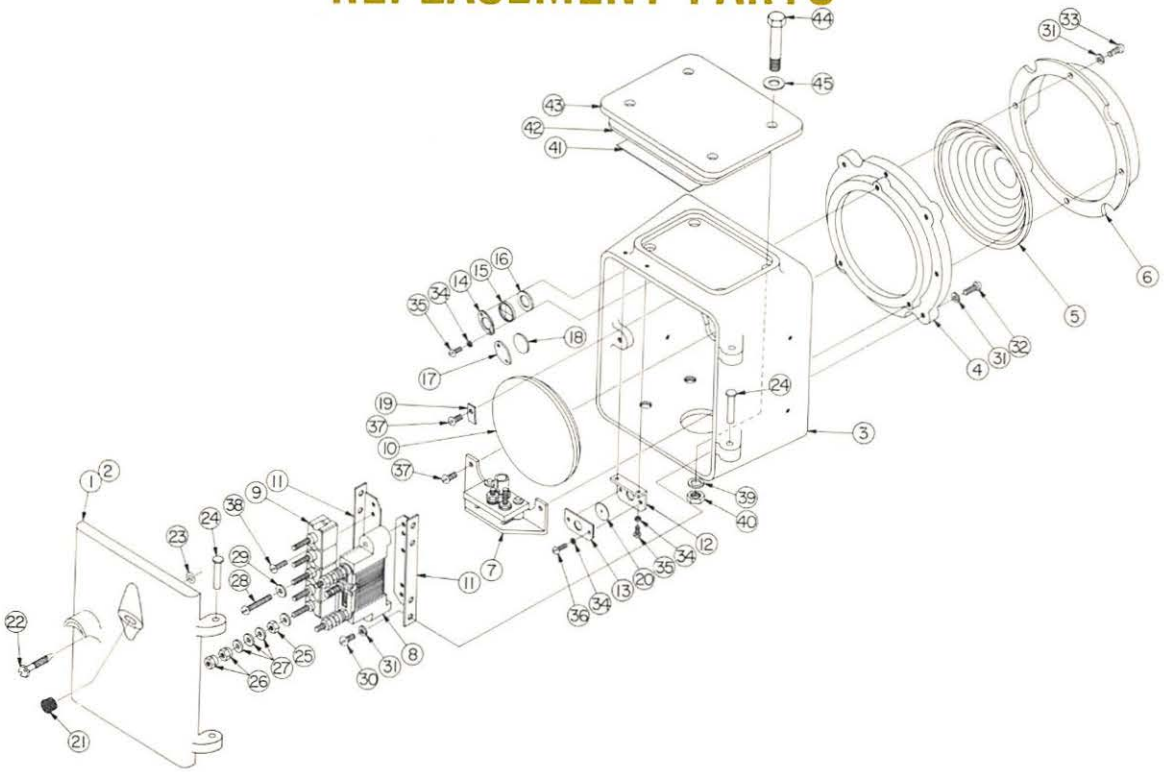
Visors for the Model CLS-10D are available in black, high density, polyethylene plastic or steel painted black with non-reflecting surfaces. Visor assemblies listed below include all appropriate mounting hardware.

To Order: Specify Description and Part Number.



Description	Part Number
Visor, Steel	042005-35X
Visor, Plastic	042005-19X
Visor, Aluminum	042005-107X

MODEL CLS-10D DWARF COLOR LIGHT SIGNAL REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Door, CLS-10D	1	042610	28	Machine Screw, Round Head, #10-24 x 1.5"	2	2600-RSC
2	Gasket, Door	1	104505				
3	Housing, CLS-10D	1	042609	29	Washer, Flat, #10	2	1710-SC
4	Housing, Lens	1	042611	30	Machine Screw, Round Head, 1/4"-20 x .375"	4	2665-RSC
5	Doublet, Outer (see page C-2-3)	1	Specify				
6	Adapter, Hood	1	042612	31	Washer, Spring Lock, M, 1/4"	12	1808-MSC
7	Support, Lamp	1	042265-X	32	Machine Screw, Round Head, 1/4"-20 x 1"	4	2662-RSC
8	Resistor, Adjustable, 5 Ohm	1	029603-2X				
9	Block, Terminal	5	023390-15X	33	Machine Screw, Round Head, 1/4"-20 x .75"	4	2660-RSC
10	Doublet, Inner (see page C-2-3)	1	Specify				
11	Bracket	2	042286-8	34	Washer, Spring Lock, M, #10	6	1806-MSC
12	Bracket, Rear Sight	1	042260-6	35	Machine Screw, Round Head, #10-24 x .5"	4	2590-RSC
13	Plate, Hold Down	1	042260-7				
14	Retainer	1	042261-4	36	Machine Screw, Truss Head, #10-24 x .312"	2	2589-TSC
15	Sight, Front	1	042260-4				
16	Gasket	1	042261-3	37	Screw, Retaining	3	042266
17	Plate, Cover	1	042261-5	38	Machine Screw, Fillister Head, #10-24 x .625"	2	2594-LSC
18	Gasket	1	042261-6				
19	Clamp, Lens	1	042026	39	Washer, Spring Lock, M, 1/2"	4	1812-MSC
20	Disc, Peep Sight	1	042260-3	40	Nut, Hex, 1/2"-13	4	2108-SC
21	Bushing, Vent	1	041913-X	41	Gasket	1	042268
22	Screw, Hex Locking	1	042056	42	Gasket	2	042268-3
23	O-Ring	1	042380	43	Cap	1	042255-2
24	Rivet, 5/16" x 1.25"	2	3726-RA	44	Cap Screw, Hex Head, 1/2"-13 x 2.75"	4	4173-HSC
25	Nut, Clamp	5	023832				
26	Nut, Binding	10	023831	45	Washer, Lead	4	042268-2
27	Washer, Beveled	20	023834				

Safetran

LIMITED CLEARANCE UNILENS® SIGNAL

MODEL IW10-RT

- **DESIGNED FOR MINIMUM CLEARANCE**
- **TRANSMITS UP TO 4 COLOR ASPECTS**
- **WEATHERPROOF CAST ALUMINUM HOUSING**
- **STACKABLE FOR MULTIPLE INDICATION**

The Model IW10-RT Limited Clearance Colorlight Signal is a compact Unilens® type wayside signal designed for use in limited clearance applications. It has the capability of transmitting up to 4 color aspects through a common lens system. A single 6-3/8 inch diameter stepped lens with 3-3/4 inch focal length is used.

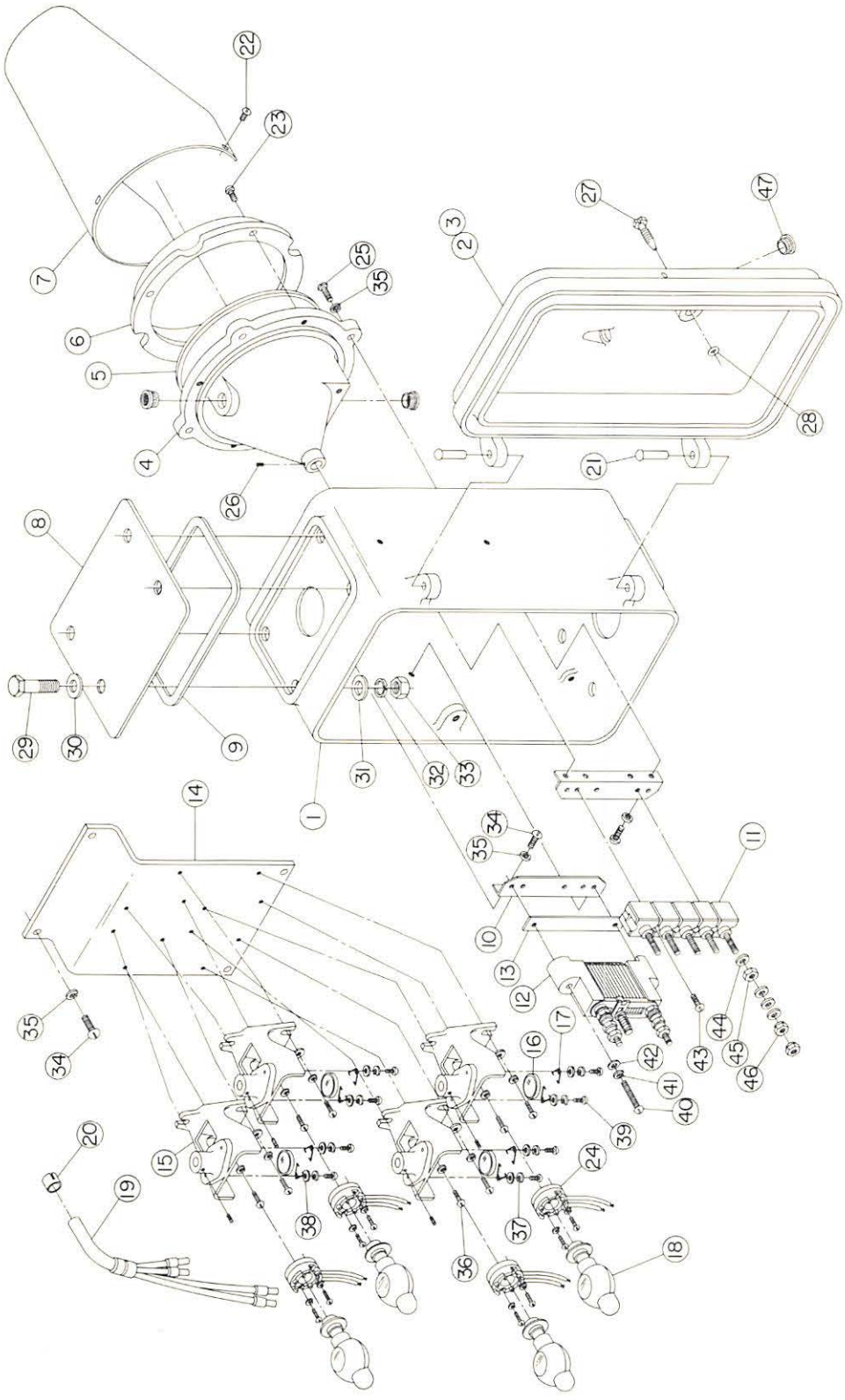
Mountings are available for top of mast, base, or brackets for wall installation. Where multiple arm signals are required the IW10-RT can be assembled in a vertical, stack arrangement.

ORDERING INFORMATION

To Order: Specify the following:

1. Limited Clearance Unilens®Signal
2. Number of Signal heads needed in each assembly
3. Lens (see page C-3-4), and bulb (see page A-7-4)
4. Color indications, available are red, green, yellow, and lunar white
5. Color locations for stacked heads (top to bottom)
6. Visor — either steel, plastic or aluminum
7. Mounting bracket description and part number (see page C-3-4)

IW10-RT LIMITED CLEARANCE UNILENS® ASSEMBLY



IW10-RT LIMITED CLEARANCE
UNILENS REPLACEMENT PARTS

Item No.	Description	Qty. Req'd.	Part Number
1	Housing, IW10-RT	1	042311-2
2	Cover, IW10-RT	1	042312-2
3	Gasket, Door	4 ft.	104512
4	Cone, Light	1	042313-1
5	Lens (See page C-3-4)	1	Specify
6	Adapter, Lamp Hood	1	042612
7	Visor, Plastic	1	042005-19
	Visor, Steel	1	042005-35
	Visor, Aluminum	1	042005-107
8	Cap	1	042255-2
9	Gasket	1	042268-3
10	Bracket, Mounting	2	042286-8
11	Block, Terminal	5	03390-15X
12	Resistor, Adjustable	1	029602-4X
13	Guard, Fibre	1	029602-37
14	Support, Light	1	042315
15	Holder, Bulb	4	042284-4
16	Disc, Color Red		042289-X
	Disc, Color Green		042290-X
	Disc, Color Green (Non Cracked)		042290-XA
	Disc, Color Yellow		042291-X
	Disc, Color Lunar		042291-1X
	Disc, Color Lunar (Non Cracked)		042291-1XA
17	Spring, Retaining	8	042292-2
18	Lamp	4	042285-1
19	Light, Pipe Quadfurcated	1	042285-12
	Light, Pipe Trifurcated	1	042285-11
	Light, Pipe Bifurcated	1	042285-15
20	Cap, Antiphantom	1	042285-14
21	Rivet, Round Head, 5/16 x 1.25"	2	3726-RA
22	Machine Screw, Slotted Head #10 - 24 x .3125	3	2599-TEJ

Item No.	Description	Qty. Req'd	Part Number
23	Screw, Lens Ring Retaining	4	042266-2
24	Lamp Socket Assembly	4	042294-1X
25	Machine Screw, Fillister Head 1/4 - 20 x .875	4	2661-REJ
26	Set Screw, Socket Head #5 - 40 x .25	8	4518-SC
27	Screw, Hex Locking	1	042056
28	O-Ring	1	042380
29	Cap Screw, Hex Head 1/2" - 13 x 1.75"	4	4169-HSC
30	Washer, LED	4	042268-2
31	Washer, Flat	4	1730-SC
32	Washer, Spring Lock, M, 1/2	4	1812-MSC
33	Nut, Hex 1/2" - 13	8	2108-SC
34	Machine Screw, Round Head 1/4 - 20 x .625	8	2659-RSC
35	Washer, Spring Lock, M, 1/4	8	1808-MSC
36	Machine Screw, Round Head #8 - 32 x .625	12	2576-RSC
37	Washer, Spring Lock, M, #8	12	1805-MSC
38	Washer, Flat	20	1709-SC
39	Machine Screw, Round Head #8 - 32 x .375"	8	2572-RSC
40	Machine Screw, Round Head #10 - 24 x 1.5"	2	2600-RSC
41	Washer, Spring Lock	2	1806-MSC
42	Washer, Flat #10	2	1712-SC
43	Machine Screw, Round Head #10 - 24 x .625"	2	2594-RSC
44	Washer, Beveled	20	023834
45	Nut, Clamp	5	023832
46	Nut, Binding	10	023831
47	Bushing, Vent	3	041913-X

LENSES FOR IW10-RT

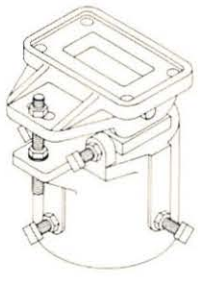
All lenses listed below are 6-3/8 inch diameter stepped lenses with 3-3/4 inch focal lengths. They are clear in color and available in glass or plastic.

To Order: Specify Description, Deflection, Material, and Part Number.

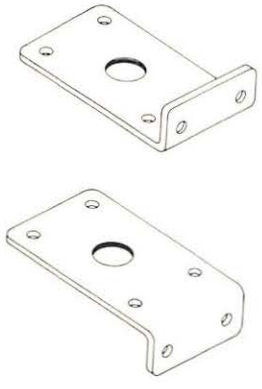
Description	Deflection	Material	Part Number
IW10-RT Lens	None	Plastic	042210
IW10-RT Lens	40° Centerspot	Plastic	042210-1
IW10-RT Lens	None	Glass	042210-2
IW10-RT Lens	40° Centerspot	Glass	042210-3

MOUNTING BRACKETS

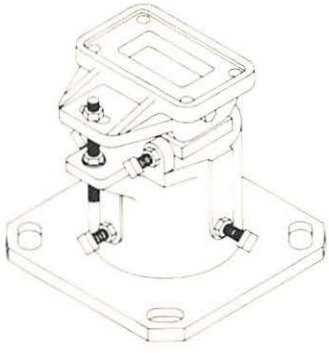
Mounting brackets are for top of mast, base, or wall installation. Base Mountings are for either 6-3/4 x 6-3/4 inch or 8 x 8 inch bolt spacing. Mounting bracket assemblies are adjustable for both vertical and horizontal alignment. Top of mast mounting is for 5 inch mast unless otherwise specified.



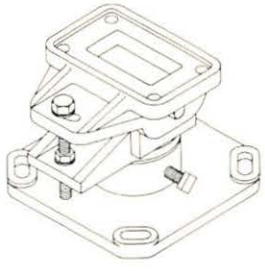
Top of Mast Mounting



Side of Wall Mounting



Mounting Base 8" x 8" Bolt Spacing



Mounting Base 6¾" x 6¾" Bolt Spacing

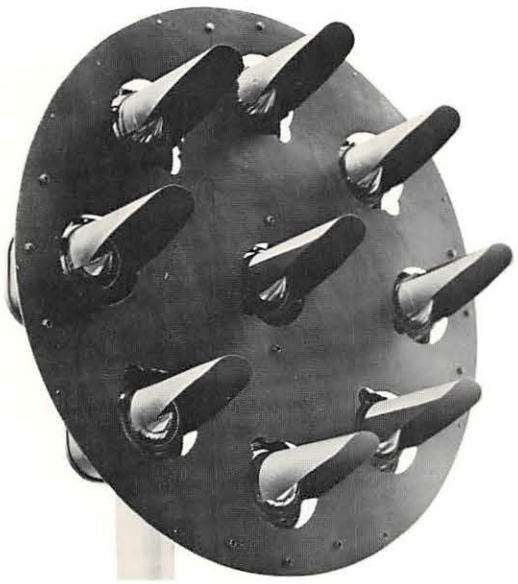
To Order: Specify Description and Part Number.

Description	Part Number
Top of Mast Mounting Bracket, 5"	042254-2X
Side of Wall Mounting Bracket	042316-X
Mounting Base of 8" x 8" Bolt Spacing	042275-3X
Mounting Base for 6-3/4" Bolt Spacing	042275-1X

Safetran

POSITION LIGHT SIGNAL

MODEL SPL



- **LIGHTWEIGHT, WEATHER-PROOF CAST ALUMINUM CONSTRUCTION**
- **FACTORY PRE-ALIGNED LAMP HOLDERS**
- **NO MIRRORS ARE USED IN THE OPTICAL SYSTEM**
- **MEETS APPLICABLE AAR SPECIFICATIONS**

The Model SPL Position Light Signal provides a combination of light units on an 18 inch radius with central unit. It features lightweight cast aluminum construction and is available with heavy polyethylene background and steel visors.

The optical system uses a standard doublet lens combination with an outer conical lens cover. The inner lens, outer lens, and conical lens cover measure 5-1/2, 6-3/4, and 5-3/8 inches in diameter respectively. The Model SPL is capable of 4 different aspects, each having light units with clear inner and outer lenses and light yellow conical lens cover. However, aspect 1 may be ordered with red inner lens, clear outer lens and conical lens covers. As no mirrors are used, external light reflections are minimized. The Model SPL employs the use of antiphantom screens located between inner and outer lenses.

The lamp housings and junction boxes are weatherproof and well ventilated to minimize condensation. The covers are easily removed for inspection and maintenance. All wires are brought out of a single junction box with 2 inch conduit adapter.

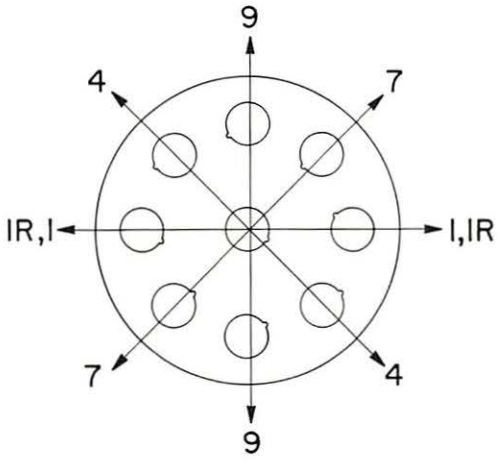
A standard S-11 signal lamp is used in a factory pre-aligned lamp holder. An alignment scope is built into each lamp head; therefore, each unit may be adjusted individually for proper beam alignment.

Mast mounting brackets for the SPL have vertical spacing of 13 inches. This allows for mounting on short doll masts.

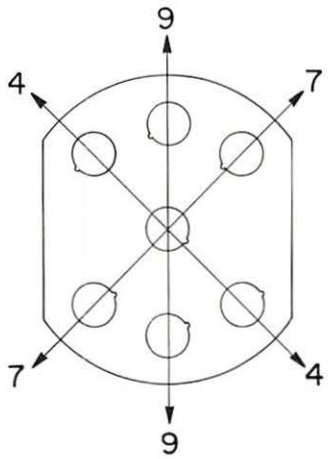
The Model SPL meets or exceeds all applicable AAR specifications.

ORDERING INFORMATION

The Model SPL Position Light is available with 2 different background types as shown below. Aspect 1R has red inner lens with clear outer lens and conical lens covers. All other aspects have clear inner and outer lenses with light yellow conical lens cover.



TYPE A



TYPE B

To Order: Specify Aspects and Part Number.

TYPE A

Aspects	Part Number	Aspects	Part Number	Aspects	Part Number	Aspects	Part Number
1	042750-AX	1-9	042750-DX	4-9	042750-NX	IR-9	042750-DIX
4	042750-JX	1-4-7	042750-EX	4-7-9	042750-PX	IR-4-7	042750-EIX
7	042750-KX	1-4-9	042750-FX	7-9	042750-RX	IR-4-9	042750-FIX
9	042750-LX	1-7-9	042750-GX	IR	042750-AIX	IR-7-9	042750-GIX
1-4	042750-BX	1-4-7-9	042750-HX	IR-4	042750-BIX	IR-4-7-9	042750-HIX
1-7	042750-CX	4-7	042750-MX	IR-7	042750-CIX		

TYPE B

Aspects	Part Number	Aspects	Part Number	Aspects	Part Number	Aspects	Part Number
4	042750-SX	9	042750-UX	4-9	042750-WX	7-9	042750-ZX
7	042750-TX	4-7	042750-VX	4-7-9	042750-YX		

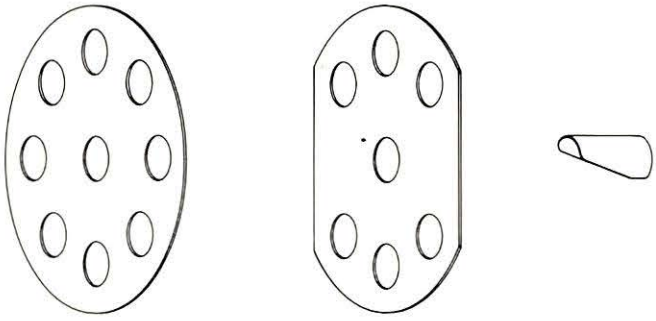
LENSES AND COVERS

Lenses for the Model SPL Position Light Signal are available in glass or high impact plastic. Both lens types provide a full face high intensity indication light. These lenses meet or exceed applicable AAR specifications.

To Order: Specify Diameter, Focal Length, Color, Material, and Part Number.

Diameter	Focal Length	Color	Material	Part Number	Application
5-1/2"	1/2"	Clear	Glass	042257-IC	Inner Lens
5-1/2"	1/2"	Clear	Plastic	042257-4C	Inner Lens
5-1/2"	1/2"	Red	Glass	042257-IR	Inner Lens
5-1/2"	1/2"	Red	Plastic	042257-4R	Inner Lens
5-3/8"	None	Clear	Plastic	042210-5	Conical Cover
5-3/8"	None	Lt. Yellow	Plastic	042210-4	Conical Cover
6-3/8"	3-3/4"	Frosted	Plastic	042210-F	Outer Lens

BACKGROUNDS AND VISORS

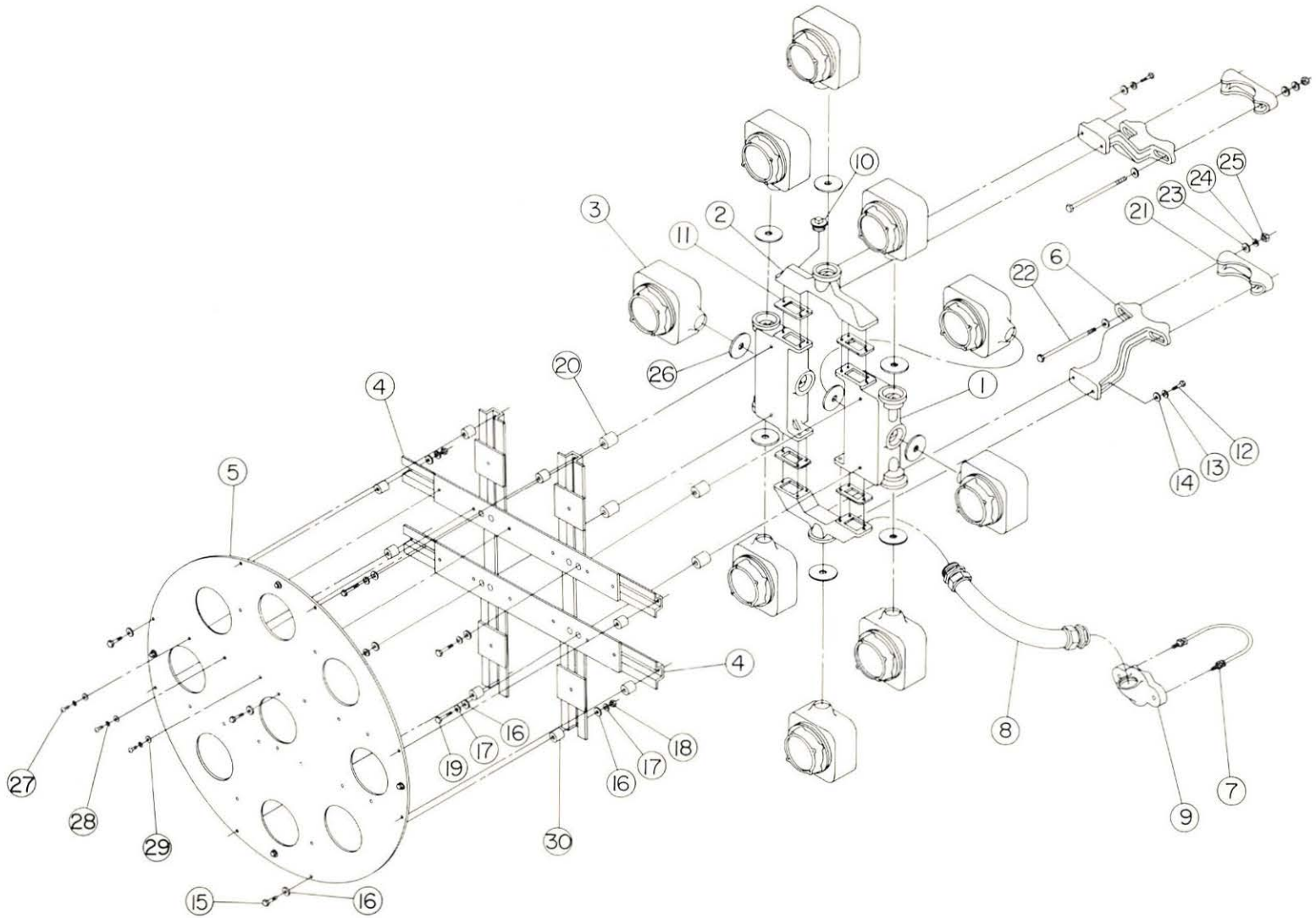


TYPE A TYPE B VISOR

To Order: Specify Description and Part Number.

Description	Part Number
Background A, for aspects 1-4-7-9	042005-58AX
Background B, for aspects 4-7-9	042005-63AX
Visor	042005-55

MODEL SPL POSITION LIGHT SIGNAL ASSEMBLY

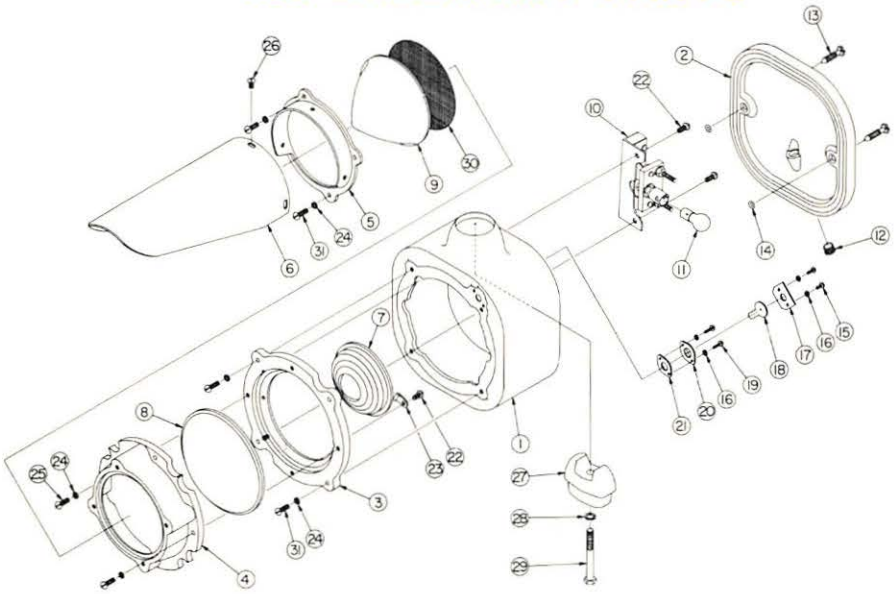


MODEL SPL POSITION LIGHT SIGNAL REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Item No.	Description	Quantity Required	Part Number
1	Box, Junction (with terminals)	1	042753-2X
	Box, Junction (without terminals)	1	042753-3X
2	Saddle, Support	2	042751-1
3	Lamp, Position Light (specify lenses desired, see page C-4-3)	Specify	Specify
4	Support Assembly, Background (for aspects 1-4-7-9) Type A	1	042005-96X
	Support Assembly, Background (for aspects 4-7-9) Type B	1	042005-98X
5	Background (for aspects 1-4-7-9) Type A w/HDW	1	042005-58AX
	Background (for aspects 4-7-9) Type B w/HDW	1	042005-63AX
6	Bracket, Stand Off	2	042754-3
7	U-Bolt Assembly, 5"	1	035005-2X
8	Connection Assembly, 2"	1	076058-7X
9	Bracket, Wire Entry, 45°	1	042250-333
10	Plug, Pipe, 2"	3	5337-P
11	Gasket	4	042005-81
12	Cap Screw, Hex Head, 1/2"-13 x 1.75"	4	4169-HEJ
13	Washer, Spring Lock, M, 1/2"	4	1812-MEJ
14	Washer, Flat, 1/2"	4	1755-EJ
15	Cap Screw, Hex Head, 3/8"-16 x 2"	10	4092-HEJ
16	Washer, Flat, 3/8"	20	1726-EJ
17	Washer, Spring Lock, M, 3/8"	12	1810-MEJ
18	Nut, Hex, 3/8"-16	8	2104-EJ
19	Cap Screw, Hex Head, 3/8"-16 x 3"	4	4100-HEJ
20	Stand Off	4	042005-56
21	Saddle, 5"	2	070950
22	Cap Screw, Hex Head, 3/4"-10 x 8.5"	4	3181-SJ
23	Washer, Flat, 3/4"	4	1737-SJ
24	Washer, Spring Lock, M, 3/4"	4	1815-SJ
25	Nut, Hex, 3/4"-10	4	2114-SJ
26	Gasket	9	042771
27	Machine Screw, Round Head 1/4"-20 x 3/4"	16	2660-REJ
28	Washer, Lock, 1/4"	16	1808-MEJ
29	Washer, Flat, 1/4"	16	1751-EJ
30	Spacer	8	042005-93

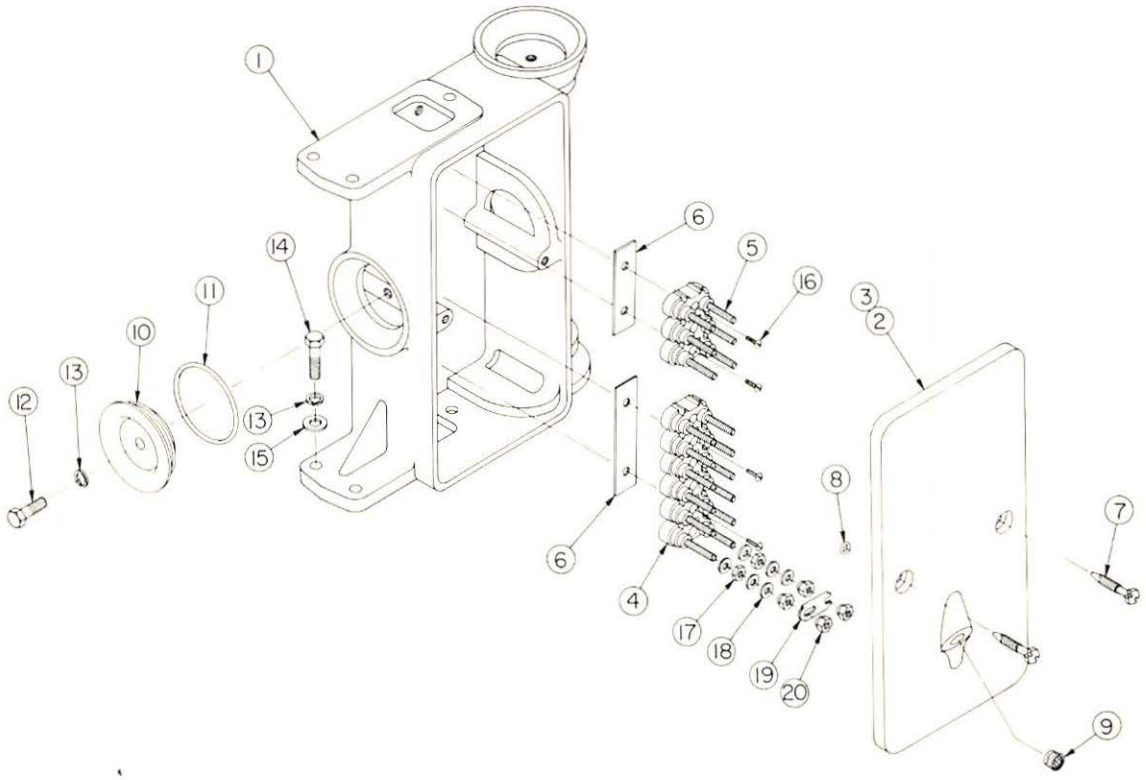
LAMP HEAD ASSEMBLY REPLACEMENT PARTS



For complete assembly, order Part Number 042752-2X.
To Order: Specify Description and Part Number.

Item No.	Description	Quantity Required	Part Number
1	Housing, Lamp	1	042752-1
2	Cover, Housing	1	042759-1
3	Housing, Lens	1	042611-1
4	Bracket, Cone	1	042755-1
5	Adapter, Lamp Hood	1	042756-1
6	Hood, Lamp	1	042005-5
7	Lens, Inner (see page C-4-3)	1	Specify
8	Lens, Outer	1	042210-F
9	Lens Cover, Conical (see page C-4-3)	1	Specify
10	Assembly, Lamp and Support	1	042265-10X
11	Bulb (see page A-7-4)	1	Specify
12	Bushing, Vent	1	041913-X
13	Screw, Hex Locking	2	042056
14	O-Ring	2	042380
15	Machine Screw, Truss Head, #10-24 x .312"	2	2589-TEJ
16	Washer, Spring Lock, M, #10	4	1806-ME
17	Plate, Hold Down	1	042260-7
18	Disc, Peep Sight	1	042260-9
19	Machine Screw, Round Head, #10-24 x .5"	2	2592-REJ
20	Sight, Front	1	042260-8
21	Retainer, Front Sight	1	042261-4X
22	Screw, Retaining	3	042266
23	Clamp, Lens	1	042026-7
24	Washer, Spring Lock, M, 1/4"	12	1808-MEJ
25	Machine Screw, Round Head, 1/4"-20 x .875"	4	2661-REJ
26	Machine Screw, Truss Head, #10-24 x .312"	3	2589-TEJ
27	Washer, Adjusting	1	042757-I
28	Washer, Spring Lock, M, 3/8"	1	1810-MEJ
29	Cap Screw, Hex Head, 3/8"-16 x 3.5"	1	4099-HEJ
30	Screen, Antiphantom	1	042258-6
31	Machine Screw, Round Head, 1/4"-20 x .75"	8	2660-REJ

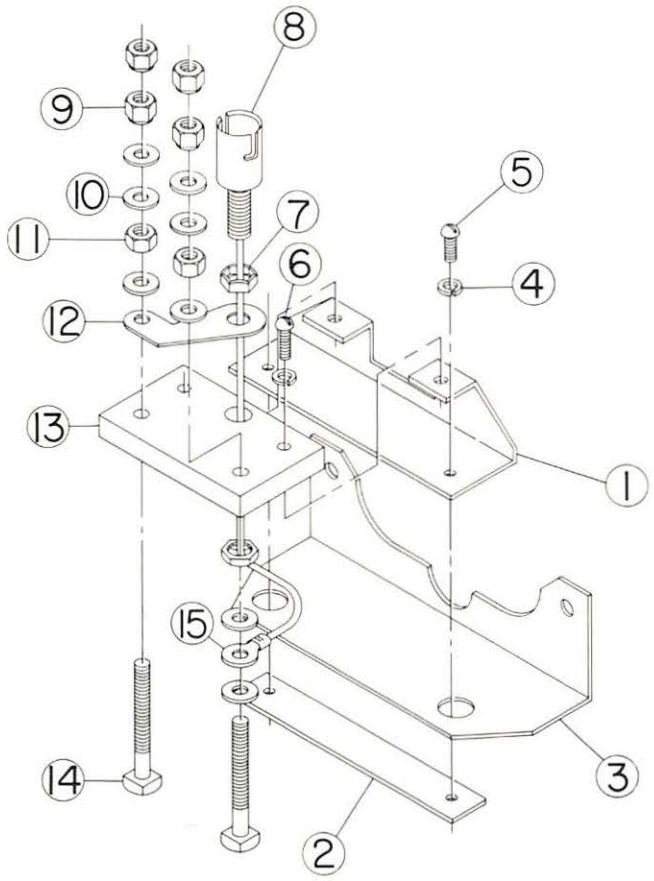
JUNCTION BOX ASSEMBLY
REPLACEMENT PARTS



For complete assembly less items 10, 11, 12, 13, 14, 15, order Part Number 042753-2X.
To Order: Specify Description and Part Number.

Item No.	Description	Quantity Required	Part Number
1	Box, Junction (for use with terminals)	1	042753-1
	Box, Junction (for use without terminals)	1	042753-4
2	Cover, Junction Box	1	042760-1
3	Packing, Door	3.5 ft.	104513
4	Block, Terminal	1	023274-1X
5	Block, Terminal	1	023274-505
6	Pad, Filler	1	106010
7	Screw, Hex Locking	2	042056
8	O-Ring	2	042380
9	Bushing, Vent	1	041913-X
10	Cap, Lamp Socket	1	042758-1
11	O-Ring	1	042380-2
12	Cap Screw, Hex Head, 3/8" 16 x 1.25"	1	4089-HEJ
13	Washer, Spring Lock, M, 3/8"	5	1810-MEJ
14	Cap Screw, Hex Head, 3/8"-16 x 1.25"	12	4089-HSC
15	Washer, Flat, 3/8"	12	1726-EJ
16	Machine Screw, Fillister Head, 1/4"-20 x .75"	4	2660-LBN
17	Nut, Clamp	18	023832
18	Washer, Beveled	54	023834
19	Connector, Terminal	9	023837
20	Nut, Binding	36	023831

LAMP SUPPORT BRACKET REPLACEMENT PARTS



For complete assembly order part number 042265-10X.
To Order: Specify Description and Part Number.

Item No.	Description	Quantity Required	Part Number
1	Support, Lamp	1	042265-12
2	Plate, Locking	1	042265-13
3	Bracket, Lamp	1	042265-11
4	Washer, Spring Lock #10	4	1806-ME
5	Machine Screw, Pan Head 10-32 x .375"	2	2614-PE
6	Machine Screw, Round Head 10-32 x .5"	2	2616-RE
7	Nut, Pal, 7/16"-20	2	2350-SN
8	Socket, Long Lamp	1	042019-2
9	Nut, Binding	4	023831
10	Washer, Beveled	9	023834
11	Nut, Clamp	2	023832
12	Connector, Offset	1	042265-14
13	Base, Bulb Socket	1	042263-1
14	Post, Terminal	2	023833
15	Wire Assembly	1	042021-1X

Safetran

DWARF POSITION LIGHT SIGNAL

MODEL SPL-D

SEALED, FACTORY PRE-ALIGNED LAMP HOLDERS

NO MIRRORS ARE USED IN THE OPTICAL SYSTEM

WEATHERPROOF, LIGHTWEIGHT ALUMINUM CONSTRUCTION

The Model SPL-D is a short range, base mounted dwarf position light signal housed within an aluminum casting. Sealed lamp assemblies and a neoprene gasket in the cover provide for a weatherproof housing. The cover, which is secured by a single bolt and reinforced by optional padlock, is easily removed for inspection and maintenance.

The optical system uses a standard doublet lens combination with a frosted outer lens cover. The inner lens, outer lens, and outer lens cover measure 2-3/4, 4, and 4 inches in diameter respectively. Standard S-11 signal lamps are used within factory pre-aligned lamp holders. The frosted outer lens cover and six inch steel visors minimize external light reflections. No mirrors are used in the optical system.

Blanking plates are furnished when less than four aspects are desired.

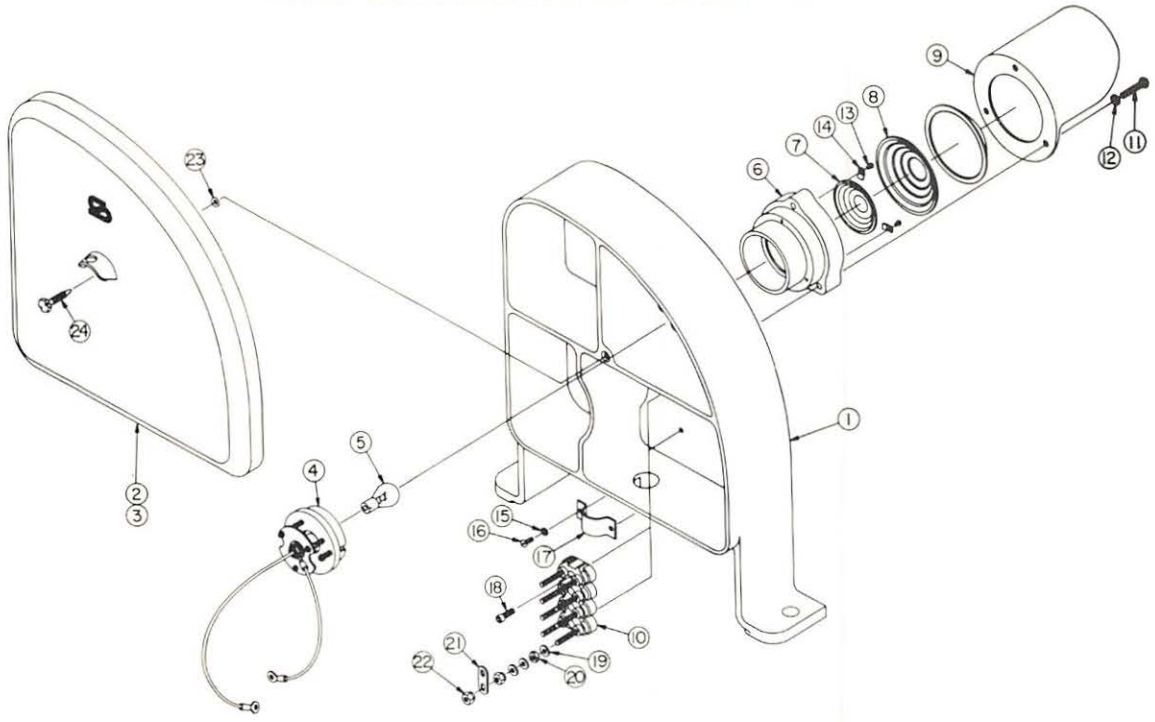
Two 7/8 inch diameter holes, spaced at 17 inches, provide for mounting of the unit.

The model SPL-D measures 18-1/2 inches in height, 19 inches in width, 11-3/4 inches in depth, and weighs 50 pounds.

To Order: Specify Description and Part Number.

Description	Part Number
Model SPL-D Dwarf Position Light Signal (Specify desired aspects and their locations)	042780-AX

MODEL SPL-D DWARF POSITION LIGHT SIGNAL REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item No.	Description	Quantity Required	Part Number
1	Housing, Model SPL-D	1	042781-1
2	Cover, Model SPL-D	1	042782-1
3	Gasket, Cover, .5" x .5"	1	10-06-002
4	Support, Lamp Assembly	4	042783-X
5	Bulb (See page A-7-4)	4	Specify
6	Housing, Lens Retaining	4	042784-1
7	Lens, Inner	4	042786-2
8	Lens, Outer	4	042786-1
9	Visor	4	042785-1
10	Block, Terminal	4	023274-24X
11	Machine Screw, Round Head, 1/4"-20 x 1.75"	12	2666-REJ
12	Washer, Spring Lock, M, 1/4"	12	1808-MEJ
13	Machine Screw, Round Head, #6-32 x .187"	12	2554-REO
14	Clip, Lens	12	042026-8
15	Washer, Spring Lock, M, #10	2	1806-MSC
16	Machine Screw, Round Head, #10-24 x .5"	2	2616-RSC
17	Clamp	1	042794
18	Cap Screw, Socket Head, 1/4"-20 x .75"	2	4002-SSC
19	Washer, Beveled	24	023834
20	Nut, Clamp	8	023832
21	Connector	3	023839-2
22	Nut, Binding	16	023831
23	O-Ring	1	042380
24	Screw, Hex Locking	1	042056

Safetran

LENSES, ROUNDELS, AND COVERS FOR WAYSIDE SIGNALS

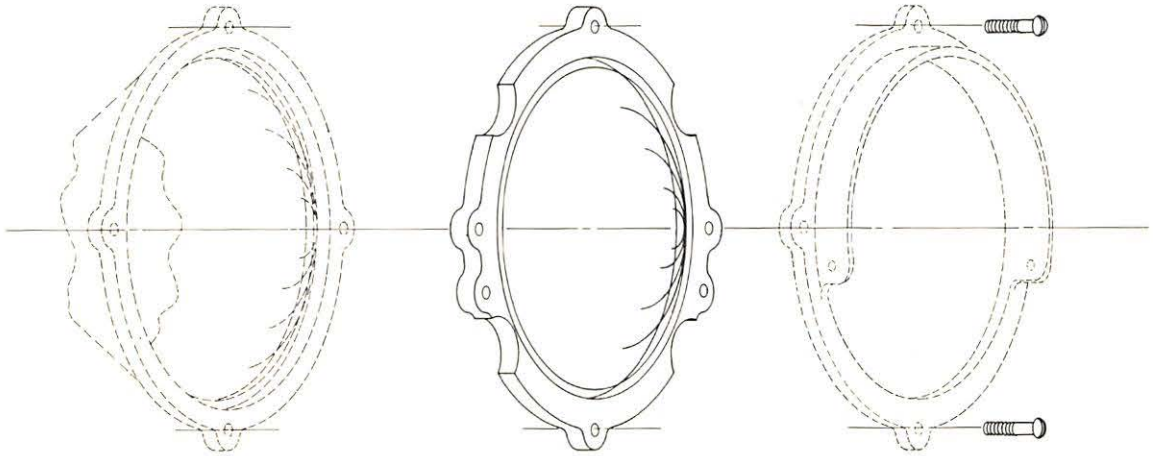
Safetran lenses and roundels are available in glass or high impact plastic. Both the lenses and roundels provide a full face high intensity indication light for wayside signals. They meet or exceed all applicable AAR specifications.

LENSES AND ROUNDELS

To Order: Specify Diameter, Focal Length, Deflection, Color, Material, and Part Number.

Diameter	Focal Length	Deflection	Color	Material	Part Number	Application
4-1/2"	6-1/2"	None	Clear	Optical Glass	042295-4	Lens
5-1/2"	1/2"	None	Clear	Glass	042257-1C	Inner Doublet
5-1/2"	1/2"	None	Clear	Plastic	042257-4C	Inner Doublet
5-1/2"	1/2"	None	Green	Glass	042257-1G	Inner Doublet
5-1/2"	1/2"	None	Green	Plastic	042257-4G	Inner Doublet
5-1/2"	1/2"	None	Lunar	Glass	042257-1L	Inner Doublet
5-1/2"	1/2"	None	Lunar	Plastic	042257-4L	Inner Doublet
5-1/2"	1/2"	None	Red	Glass	042257-1R	Inner Doublet
5-1/2"	1/2"	None	Red	Plastic	042257-4R	Inner Doublet
5-1/2"	1/2"	None	Yellow	Glass	042257-1Y	Inner Doublet
5-1/2"	1/2"	None	Yellow	Plastic	042257-4Y	Inner Doublet
5-3/8"	None	None	Clear	Plastic	042210-5	Conical Cover
5-3/8"	None	None	Lt. Yellow	Plastic	042210-4	Conical Cover
6-3/8"	3-3/4"	None	Clear	Plastic	042210	Lens
6-3/8"	3-3/4"	40° Deflecting Centerspot	Clear	Plastic	042210-1	Lens
6-3/8"	3-3/4"	None	Clear	Glass	042210-2	Lens
6-3/8"	3-3/4"	40° Deflecting Centerspot	Clear	Glass	042210-3	Lens
6-3/8"	3-3/4"	None	Frosted	Plastic	042210-F	Outer Lens
8-3/8"	4"	None	Clear	Glass	042257-10	Outer Doublet
8-3/8"	4"	None	Clear	Plastic	042257-5	Outer Doublet
8-3/8"	4"	20° Deflecting	Clear	Glass	042257-3	Outer Doublet
8-3/8"	None	20° Deflecting	Clear	Plastic	042257-8	Outer Doublet
8-3/8"	4"	40° Deflecting Centerspot	Clear	Glass	042257-2	Outer Doublet
8-3/8"	4"	40° Deflecting Centerspot	Clear	Plastic	042257-6	Outer Doublet
8-3/8"	6"	40° Deflecting Centerspot	Clear	Plastic	042295	Lens
8-3/8"	None	10° Deflecting, Clear Centerspot	Clear	Plastic	042295-3	Flat Roundel
8-3/8"	6"	30° Deflecting	Clear	Plastic	042295-2	Lens
8-3/8"	6"	40° Centerspot	Clear	Plastic	042295-1	Lens
8-3/8"	11-1/2"	None	Clear	Optical Glass	042295-5	Outer Lens
8-3/8"	None	40° Centerspot	Clear	Plastic	042295-6	Roundel
8-3/8"	None	10° Deflecting, Clear Centerspot	Clear	Plastic	042295-7	Roundel
8-3/8"	None	10° Deflecting, 40° Centerspot	Clear	Plastic	042295-8	Roundel

PLEXIGLASS LENS COVERS



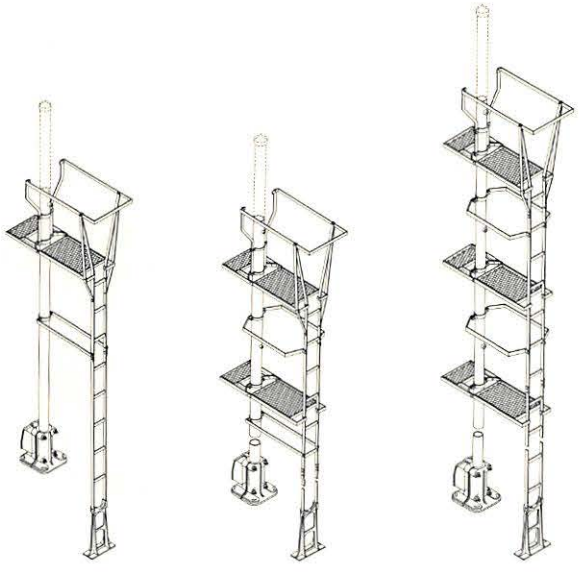
Safetran plexiglass lens covers, designed to protect signal lenses of all types, can be supplied. All mounting hardware is furnished with each lens cover assembly.

LENS COVERS ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Lens Diameter in Inches	Part Number
Safetran Unilens® IW10	8-3/8"	031261X
Color Position Light	8-3/8"	031256-X
Safetran FLX-10	8-3/8"	031251-X
Safetran CLS-10	8-3/8"	031252-X
Safetran CLS-10D	6-3/8"	031258-X
GRS Type SA	8-3/8"	031250-X
GRS Type F	5"	031257-X
GRS Type MD, ME (6-3/8" Lens) 1" Thick	6-3/8"	031258-1X
GRS Type FA	6-3/8"	031258-AX
US&S Type H-1, -2, -3, -4, and -5 (Convex)	8-3/8"	031242-X
US&S Type P-5	8-3/8"	031244-X
US&S Type H-1, -2, -3, -4, and -5 (Flat)	8-3/8"	031245-X
US&S Type N-2	6-3/8"	031246-X
Western-Cullen HC 97 Highway Crossing Lamp	8-3/8"	031254-X

WAYSIDE SIGNAL MAST AND LADDER ASSEMBLIES WITH PLATFORMS



- AVAILABLE FOR 1, 2, OR 3 LIGHT UNITS
- BOTH FRONT AND BACK PLATFORM ASSEMBLIES
- TOP, FRONT, AND SIDE MAST MOUNTING
- PIPE COUPLING FOR LIGHT UNITS ARE WELDED TO MAST
- MASTS ARE OF 5 INCH PIPE CONSTRUCTION

Wayside Signal Mast and Ladder Assemblies with platforms are designed for the mounting of wayside indication units.

The 5 inch pipe mast can be used with bases of either split or junction box type for ground mounting, or one piece base for top of case mounting. When used with junction box base, an oblong hole is cut into the mast in line with mast outlets. Another oblong hole is cut 180° from this position, allowing the location of the mast outlet coupling to be either toward or away from the ladder.

Mast outlets for the light units are 1-1/2 inch pipe couplings welded to the mast.

Platforms are of expanded metal welded to an angle frame. This frame is mounted between flat bars which serve as mounting for the ladder and mast.

The optional front platform is similar to the back platform, to which it bolts. The expanded metal surfaces of these platforms provide good footing, minimize wind load, and minimize ice/snow buildup.

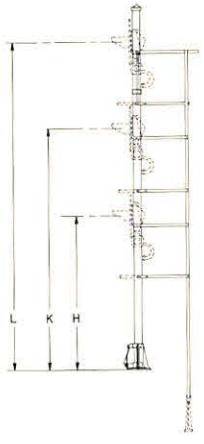
These assemblies make use of a vertical ladder, allowing the use of equal length platforms, handrails, and ladder stays. The ladder has an inside width of eight inches, with rungs spaced at fifteen inch intervals.

The masts and ladders for these assemblies can be furnished in steel or aluminum construction. If steel mast and ladders are furnished, the platforms, handrails, and ladder foundation will be steel painted with red oxide primer. If aluminum construction is specified, platforms, handrails, and ladder foundation will be galvanized steel.

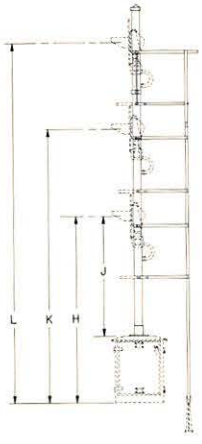
Cases for the above assemblies must be ordered separately. For additional detailed information, see section E of this catalog. When used with top of case mounting, the case required must be specified and ordered separately.

ORDERING INFORMATION

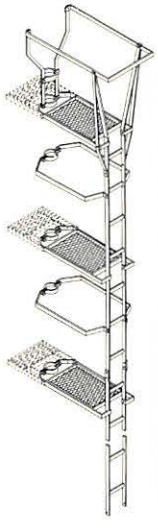
Assemblies for upper light unit to be mounted to front or side of mast.



061001-AX, BX, CX
061002-AX, BX, CX
061004-AX, BX, CX



061001-DX
061002-DX
061004-DX



061001-LPX
061002-LPX
061004-LPX

061001-L
061002-L
061004-L

To Order: Specify the following:

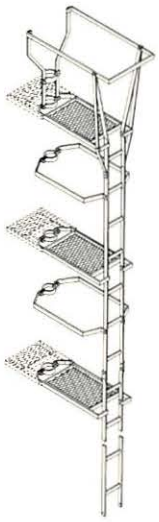
1. Description and Part Number.
2. Dimensions H, J, K, and L as required.
3. Either steel or aluminum construction.
4. Ladder Foundation if required.
5. Front Platforms if required.

Description	Part Number		
	1 Light Unit	2 Light Units	3 Light Units
Complete Assembly w/Single Junction Box Base	061001-AX	061002-AX	061004-AX
Complete Assembly w/Double Junction Box Base	061001-BX	061002-BX	061004-BX
Complete Assembly w/Split Base	061001-CX	061002-CX	061004-CX
Complete Assembly w/One Piece Base	061001-DX	061002-DX	061004-DX
Front Platform Assembly	061013-X	061013-X	061013-X
Ladder, Platform, Handrails, and Ladder Stay	061001-LPX	061002-LPX	061004-LPX
Ladder Only	061001-L	061002-L	061004-L
Mast Only	061001-M	061002-M	061004-M
Ladder Foundation	061000	061000	061000

Note: All complete assemblies are less ladder foundations. Front Platform assemblies include all mounting hardware.

ORDERING INFORMATION

Assemblies for upper light unit
to be top of mast mounted.



061021-AX, BX, CX	061021-DX	061021-LPX	061021-L
061022-AX, BX, CX	061022-DX	061022-LPX	061022-L
061024-AX, BX, CX	061024-DX	061024-LPX	061024-L

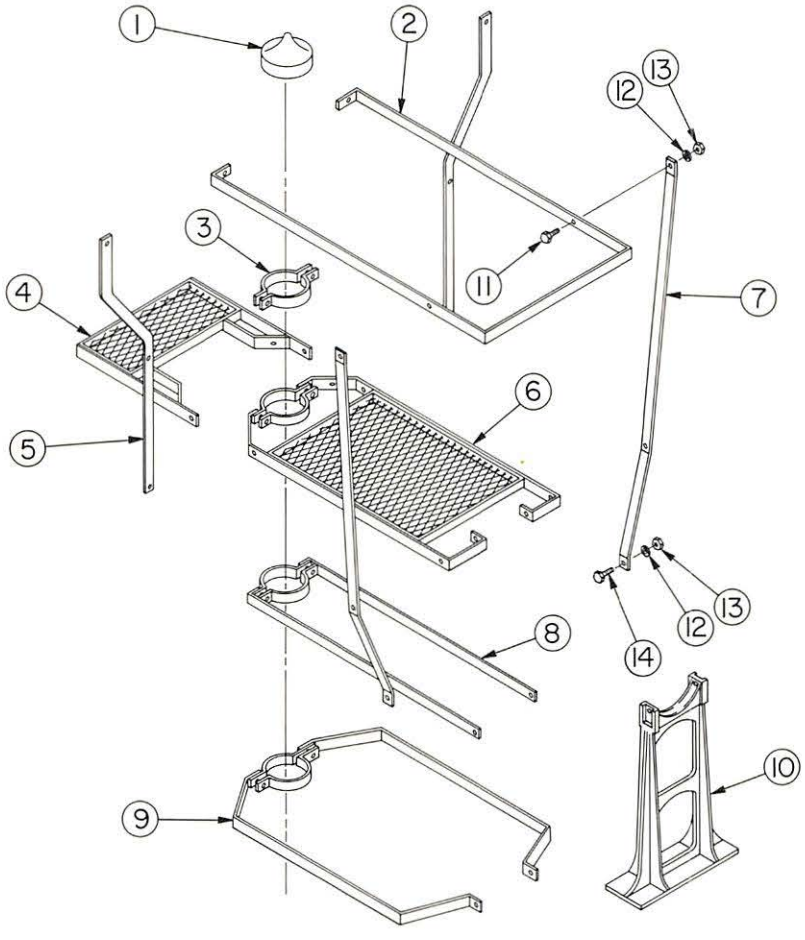
To Order: Specify the following:

1. Description and Part Number.
2. Dimensions H, J, K, and L as required.
3. Either steel or aluminum construction.
4. Ladder Foundation if required.
5. Front Platforms if required.

Description	Part Number		
	1 Light Unit	2 Light Units	3 Light Units
Complete Assembly w/Single Junction Box Base	061021-AX	061022-AX	061024-AX
Complete Assembly w/Double Junction Box Base	061021-BX	061022-BX	061024-BX
Complete Assembly w/Split Base	061021-CX	061022-CX	061024-CX
Complete Assembly w/One Piece Base	061021-DX	061022-DX	061024-DX
Front Platform Assembly	061013-X	061013-X	061013-X
Ladder, Platform, Handrails, and Ladder Stay	061021-LPX	061022-LPX	061024-LPX
Ladder Only	061021-L	061022-L	061024-L
Mast Only	061021-M	061022-M	061024-M
Ladder Foundation	061000	061000	061000

Note: All complete assemblies are less ladder foundations. Front Platform assemblies include all mounting hardware.

REPLACEMENT PARTS



To Order: Specify Description, Part Number, and either Red Oxide Primer or Galvanized Finish.

Item Number	Description	Part Number
1	Pinnacle, 5″	035045-X
2	Handrail, Top	061010-1G
3	Clamp, Pipe, 5″	035015-1
4	Platform, Front, Assembly	061013-X
5	Handrail, Top	061010-1
6	Platform, Back, Assembly	061012-X
7	Brace, Ladder Top	061011-G
8	Support, Ladder	061008-G
9	Handrail, Intermediate	061009-G
10	Foundation, Ladder	061000
11	Cap Screw, Hex Head, 1/2″-13 x 2″	4170-HSC
12	Washer, Spring Lock, M, 1/2″	1812-MSC
13	Nut, Hex, 1/2″-13	2108-SC
14	Cap Screw, Hex Head, 1/2″-13 x 1.75″	4169-HSC

Safetran

WAYSIDE SIGNAL MAST AND LADDER ASSEMBLIES WITHOUT PLATFORMS

- AVAILABLE FOR 1, 2, OR 3 LIGHT UNITS
- TOP, FRONT, AND SIDE MAST MOUNTING
- PIPE COUPLINGS FOR LIGHT UNITS ARE WELDED TO MAST
- MASTS ARE OF 5 INCH PIPE CONSTRUCTION
- SLOPING LADDER FOR ADDED SAFETY

Wayside Signal Mast and Ladder Assemblies without platforms are designed for the mounting of wayside indication units. The 5 inch pipe can be used with bases of either split or junction box type for ground mounting, or one piece base for top of case mounting. When used with junction box base, an oblong hole is cut into the mast in line with mast outlets. Another oblong hole is cut 180° from this position, allowing the location of the mast outlet coupling to be either toward or away from the ladder.

Mast outlets for the light units are 1-1/2 inch pipe couplings welded to the mast.

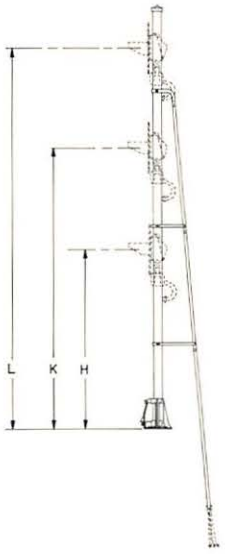
These assemblies make use of a 5 degree sloping ladder for added safety. The ladder has an inside width of eight inches, with rungs spaced at fifteen inch intervals.

The masts and ladders for these assemblies can be furnished in steel or aluminum construction. If steel masts and ladders are specified, ladder foundation will be steel painted with red oxide primer. If aluminum construction is specified, ladder foundation will be galvanized steel.

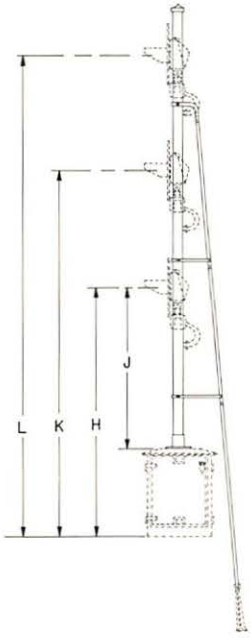
Cases for the above ladder assemblies must be ordered separately. For additional detailed information, see section E of this catalog. When used with top of case mounting, the case required must be specified and ordered separately.

ORDERING INFORMATION

Assemblies for upper light unit to be mounted to front or side of mast.



061041-AX, BX, CX
061042-AX, BX, CX
061044-AX, BX, CX



061041-DX
061042-DX
061044-DX

061041-LX
061042-LX
061044-LX

To Order: Specify the following:

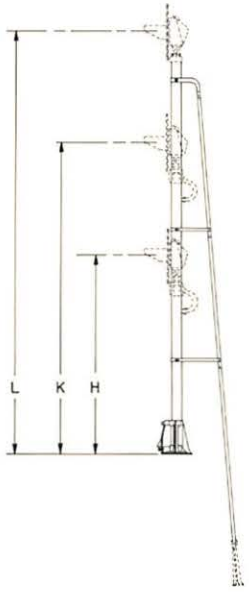
1. Description and Part Number.
2. Dimensions H, J, K, and L as required.
3. Either steel or aluminum construction.
4. Ladder Foundation if required.

Description	Part Number		
	1 Light Unit	2 Light Units	3 Light Units
Complete Assembly w/Single Junction Box Base	061041-AX	061042-AX	061044-AX
Complete Assembly w/Double Junction Box Base	061041-BX	061042-BX	061044-BX
Complete Assembly w/Split Base	061041-CX	061042-CX	061044-CX
Complete Assembly w/One Piece Base	061041-DX	061042-DX	061044-DX
Ladder and Ladder Stay Assembly	061041-LX	061042-LX	061044-LX
Mast Only	061041-M	061042-M	061044-M
Ladder Foundation	061000	061000	061000

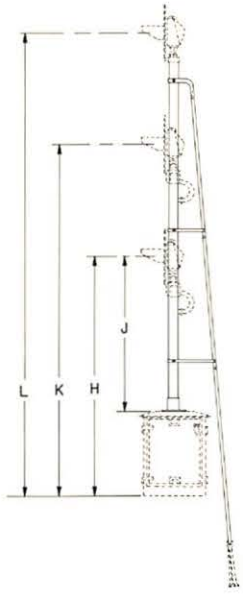
Note: All complete assemblies are less ladder foundations. Ladder and Ladder Stay Assemblies include all mounting hardware.

ORDERING INFORMATION

Assemblies for upper light unit
to be top of mast mounted.



061051-AX, BX, CX
061052-AX, BX, CX
061054-AX, BX, CX



061051-DX
061052-DX
061054-DX

061051-LX
061052-LX
061054-LX

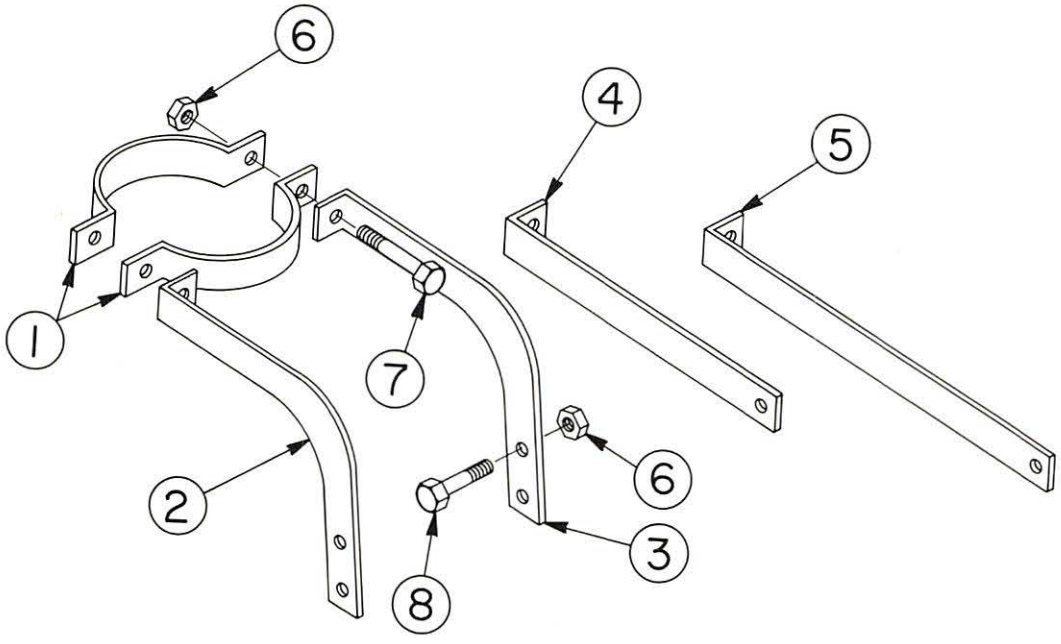
To Order: Specify the following:

1. Description and Part Number.
2. Dimensions H, J, K, and L as required.
3. Either steel or aluminum construction.
4. Ladder Foundation if required.

Description	Part Number		
	1 Light Unit	2 Light Units	3 Light Units
Complete Assembly w/Single Junction Box Base	061051-AX	061052-AX	061054-AX
Complete Assembly w/Double Junction Box Base	061051-BX	061052-BX	061054-BX
Complete Assembly w/Split Base	061051-CX	061052-CX	061054-CX
Complete Assembly w/One Piece Base	061051-DX	061052-DX	061054-DX
Ladder and Ladder Stay Assembly	061051-LX	061052-LX	061054-LX
Mast Only	061051-M	061052-M	061054-M
Ladder Foundation	061000	061000	061000

Note: All complete assemblies are less ladder foundations. Ladder and Ladder Stay Assemblies include all mounting hardware.

REPLACEMENT PARTS



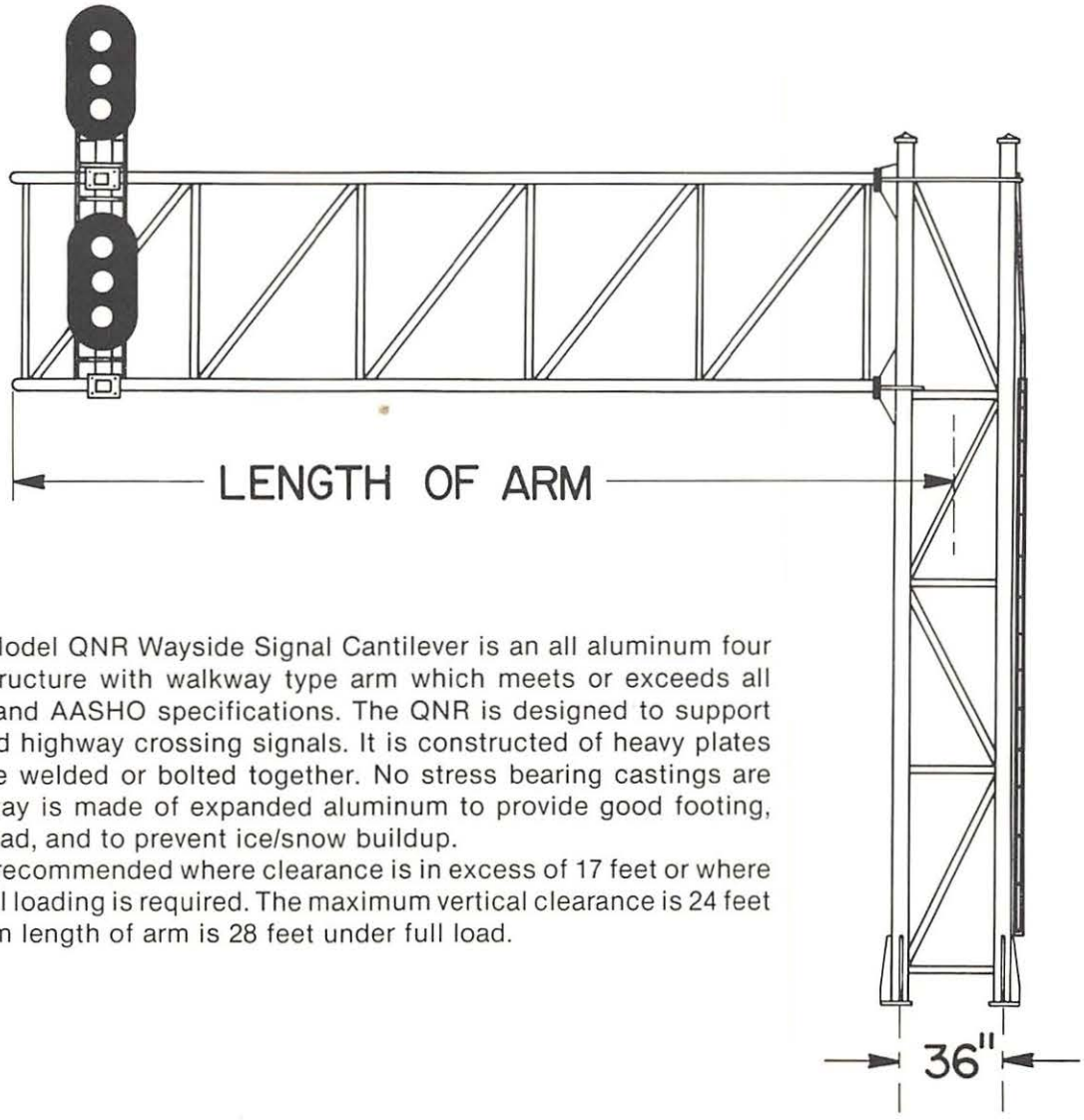
To Order: Specify Description, Part Number, and either Red Oxide Primer or Galvanized Finish.

Item Number	Description	Part Number
1	Clamp, Pipe, 5"	035015-1
2	Stay, Ladder, Left	061060-1
3	Stay, Ladder, Right	061060
4	Support, Ladder, 16-3/8"	061008-1
5	Support, Ladder, 22-7/8"	061008
6	Nut, Hex, 1/2"-13	2108-SC
7	Cap Screw, Hex Head, 1/2"-13 x 1.75"	4169-HSC
8	Cap Screw, Hex Head, 1/2"-13 x 1.25"	4167-HSC

Safetran

WAYSIDE SIGNAL CANTILEVER

MODEL QNR



Safetran's Model QNR Wayside Signal Cantilever is an all aluminum four masted tower structure with walkway type arm which meets or exceeds all applicable AAR and AASHO specifications. The QNR is designed to support both wayside and highway crossing signals. It is constructed of heavy plates and pipe that are welded or bolted together. No stress bearing castings are used. The walkway is made of expanded aluminum to provide good footing, minimize wind load, and to prevent ice/snow buildup.

The QNR is recommended where clearance is in excess of 17 feet or where extra heavy signal loading is required. The maximum vertical clearance is 24 feet and the maximum length of arm is 28 feet under full load.

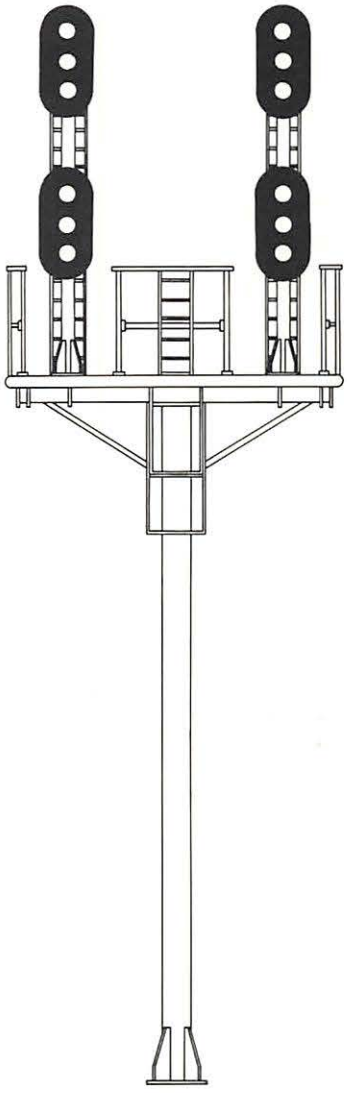
ORDERING INFORMATION

To Order: Specify the following:

1. Model QNR Wayside Signal Cantilever.
2. Length of Arm (Measured from the center of foundation to end of arm).
3. Clearance of Arm above top of foundation.
4. Location, type and quantity of wayside or highway crossing signals to be mounted on arm.

Safetran

BRACKET MAST SIGNAL



Safetran's Bracket Mast Signal is an all aluminum double masted tower structure which meets all applicable AAR specifications. It is designed to support wayside signals. It is constructed of heavy plates or pipe that are welded or bolted together. No stress bearing castings are used.

The platform is made of expanded aluminum to provide good footing, minimize wind load, and to prevent ice/snow buildup.

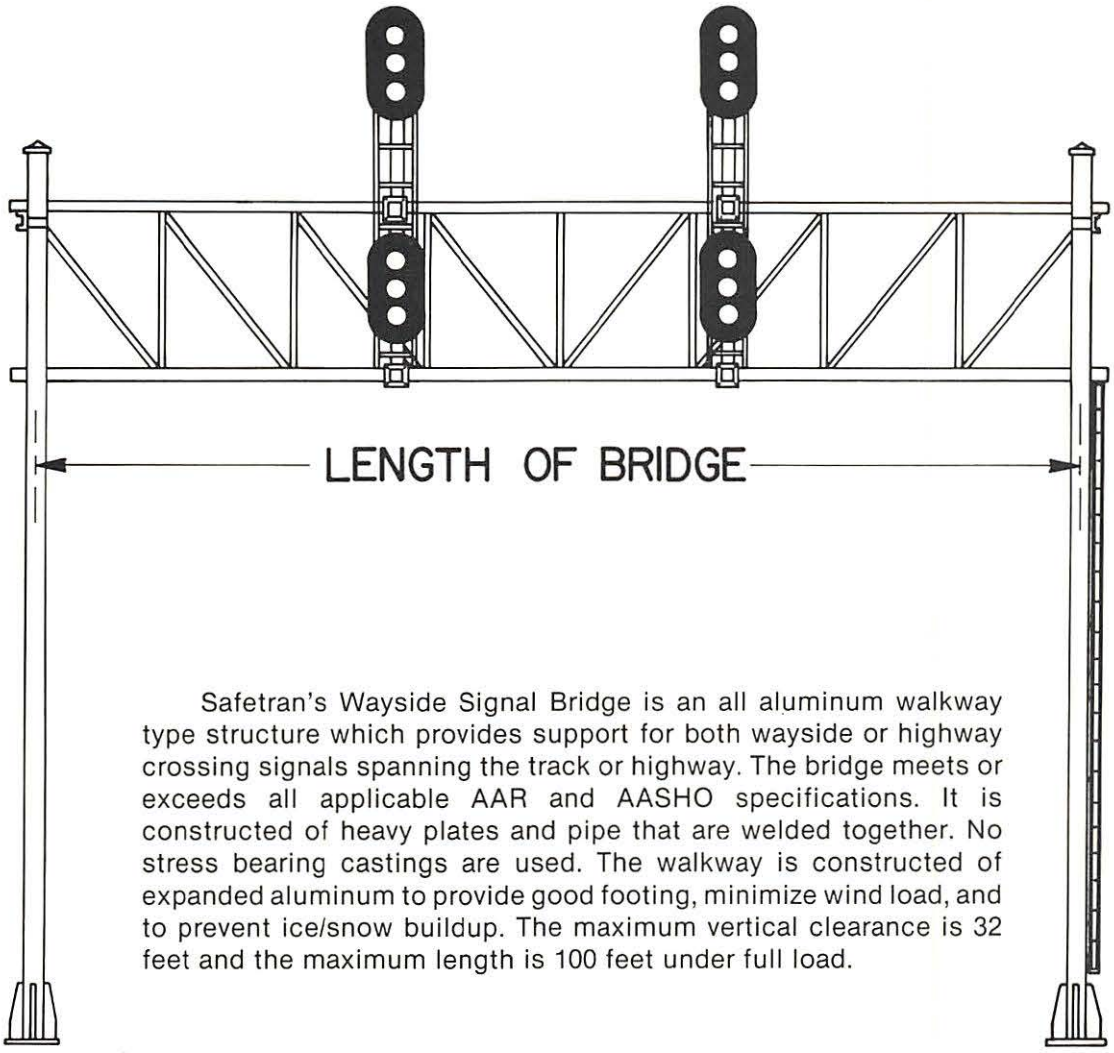
ORDERING INFORMATION

To Order: Specify the following:

1. Bracket Mast Signal.
2. Clearance of platform above top of foundation.
3. Location and quantity of wayside or highway crossing signals to be mounted on arm.

Safetran

WAYSIDE SIGNAL BRIDGE



Safetran's Wayside Signal Bridge is an all aluminum walkway type structure which provides support for both wayside or highway crossing signals spanning the track or highway. The bridge meets or exceeds all applicable AAR and AASHO specifications. It is constructed of heavy plates and pipe that are welded together. No stress bearing castings are used. The walkway is constructed of expanded aluminum to provide good footing, minimize wind load, and to prevent ice/snow buildup. The maximum vertical clearance is 32 feet and the maximum length is 100 feet under full load.

ORDERING INFORMATION

To Order: Specify the following:

1. Wayside Signal Bridge.
2. Length of Bridge (measured between centers of masts).
3. Clearance above top of foundation.
4. Location, type and quantity of wayside or highway crossing signals to be mounted on span of bridge.

Safetran

NUMBER AND LETTER PLATES AND MOUNTING BRACKETS

(Vertical)

(Horizontal)

- ENAMELED STEEL PLATES
- ALUMINUM FRAMES
- ALL APPROPRIATE MOUNTING HARDWARE INCLUDED

Unitype Number Plates are made of enameled steel and are mounted by sliding each individual plate into a vertical or horizontal unitype frame. Unitype frames are made of aluminum and are complete with all hardware required for mounting to almost any size mast.

All number and letter plates are available in both white image on black background and black image on white background.

Mounting brackets will be furnished for 5 inch pipe mast mounting unless otherwise specified.

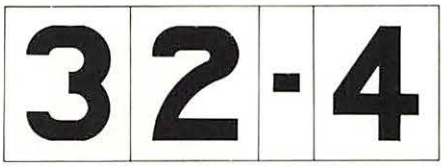
Unitype Number Plates are available in three different sizes - 5-1/2 x 8, 6-1/2 x 8, and 9-1/2 x 11-1/2 inches. Sizes of number plates other than those listed will be furnished upon request.

ORDERING INFORMATION NUMBER PLATES AND MOUNTING BRACKETS COMPLETE

To Order: Specify Number or Letter Plate size, Part Number (including Number Sequence desired), and Mast size if other than 5 inch.

Number or Letter Plate Size	Part Number	
	Vertical Mounting	Horizontal Mounting
5-1/2" x 8"	036117-583 - Number Sequence	036117-584 - Number Sequence
6-1/2" x 8"	036117-683 - Number Sequence	036117-684 - Number Sequence
9-1/2" x 11-1/2"	036117-9113 - Number Sequence	036117-9114 - Number Sequence

NUMBER AND LETTER PLATES ONLY



(Horizontal)

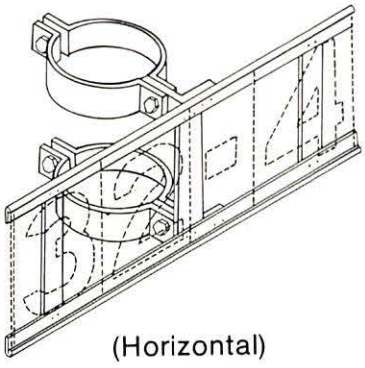
(Vertical)

To Order: Specify Number or Letter Plate size and Part Number (including number sequence desired).

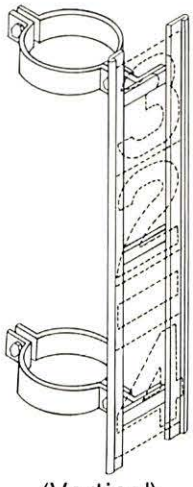
Number or Letter Plate Size	Part Number
	For both Vertical and Horizontal Mounting
5-1/2" x 8"	036117-58 - Number Sequence
6-1/2" x 8"	036117-68 - Number Sequence
9-1/2" x 11-1/2"	036117-911 - Number Sequence

For dash, add the word "Dash" in the "Number Sequence" space and specify either Vertical or Horizontal Mounting.

MOUNTING BRACKETS ONLY



(Horizontal)



(Vertical)

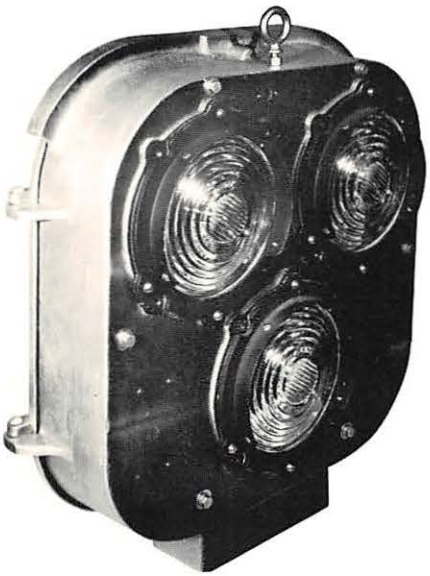
To Order: Specify Plate Bracket Size and Part Number (including Quantity of Plates)

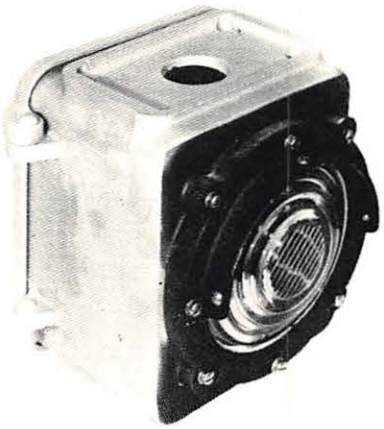
Plate Bracket Size	Part Number	
	Vertical Mounting	Horizontal Mounting
5-1/2" x 8"	036117-581 - Qty. of Plates	036117-582 - Qty. of Plates
6-1/2" x 8"	036117-681 - Qty. of Plates	036117-682 - Qty. of Plates
9-1/2" x 11-1/2"	036117-9111 - Qty. of Plates	036117-9112 - Qty. of Plates

Safetran

COLOR LIGHT SIGNAL

TYPE V AND MODEL CLS-10





The Type V Signal is a long range colorlight signal capable of displaying one to three colored lights arranged in a triangular pattern.

The Model CLS-10 is a long range colorlight signal of modular design, which allows 2, 3, or more units to be easily stacked together.

Both the Type V and CLS-10 have been superceded by the CLS-20 and V-20 colorlight signals which utilize precision die-cast housings. The CLS-10 and Type V should be used for replacement units and parts only.

ORDERING INFORMATION

To Order: Specify the following:

CLS-10

1. Model CLS-10 Color Light Signal
2. Number of units and color indication (top to bottom)
3. Lenses desired (see page C-12-2)
4. Bulb type (see page A-7-4)
5. Mounting desired (see page C-12-2)
6. Background and Visor (see page C-12-3)

Type V

1. Type V Color Light Signal
2. Number of aspects, colors and locations
3. Bulb type (see page A-7-4)
4. Type of mounting desired (see page C-12-2)

LENSES FOR THE TYPE V AND MODEL CLS-10 COLOR LIGHT

Lenses for the Type V and Model CLS-10 Color Light Signal are available in glass or high impact plastic. Both lens types provide a full face high intensity indication light. These lenses meet or exceed applicable AAR specifications.

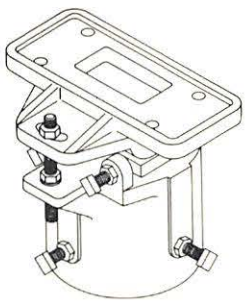
To Order: Specify Diameter, Focal Length, Deflection, Color, Material, and Part Number.

Diameter	Focal Length	Deflection	Color	Material	Part Number	Application
5-1/2"	1/2"	None	Green	Glass	042257-1G	Inner Doublet
5-1/2"	1/2"	None	Green	Plastic	042257-4G	Inner Doublet
5-1/2"	1/2"	None	Lunar	Glass	042257-1L	Inner Doublet
5-1/2"	1/2"	None	Lunar	Plastic	042257-4L	Inner Doublet
5-1/2"	1/2"	None	Red	Glass	042257-1R	Inner Doublet
5-1/2"	1/2"	None	Red	Plastic	042257-4R	Inner Doublet
5-1/2"	1/2"	None	Yellow	Glass	042257-1Y	Inner Doublet
5-1/2"	1/2"	None	Yellow	Plastic	042257-4Y	Inner Doublet
8-3/8"	4"	None	Clear	Glass	042257-10	Outer Doublet
8-3/8"	4"	None	Clear	Plastic	042257-5	Outer Doublet
8-3/8"	4"	40° Deflecting Centerspot	Clear	Glass	042257-2	Outer Doublet
8-3/8"	4"	40° Deflecting Centerspot	Clear	Plastic	042257-6	Outer Doublet
8-3/8"	4"	20° Deflecting	Clear	Glass	042257-3	Roundel
8-3/8"	None	20° Deflecting	Clear	Plastic	042257-8	Roundel
8-3/8"	None	10° Deflecting	Clear	Plastic	042295-7	Roundel

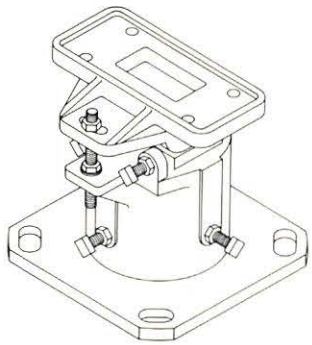
NOTE: To adapt signal to curved track, order Inner Doublet of your choice, Outer Doublet #042257-5, Roundel #042257-8, and Lens Ring #042258.

MOUNTING BRACKETS FOR TYPE V AND CLS-10 COLOR LIGHTS

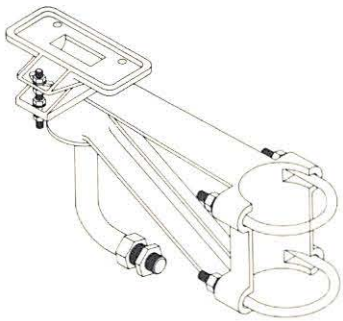
Mounting brackets are of lightweight cast aluminum construction. Both the top of mast and side or front of mast mounting brackets will be furnished for 5 inch pipe mast mounting unless otherwise specified. The mounting base assembly is to be used for 8 x 8 inch bolt spacing.



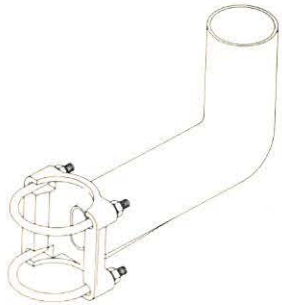
Top of Mast Mounting



Mounting Base 8" x 8" Bolt Spacing



Side or Front of Mast Mounting (external wiring)



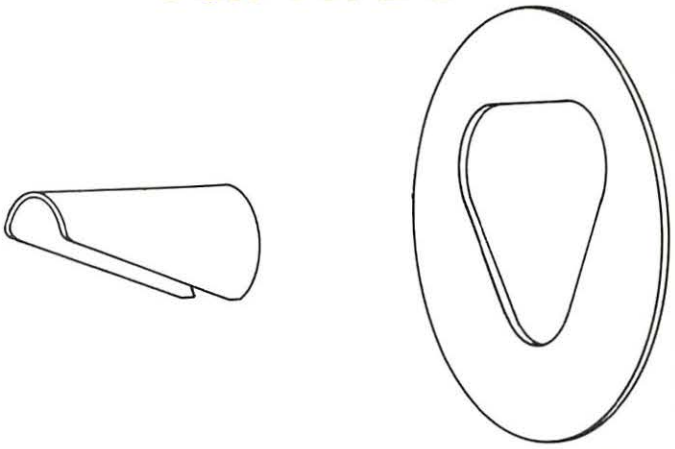
Side or Front of Mast Mounting (internal wiring)

To Order: Specify Description and Part Number.

Description	Part Number
Top of Mast Mounting Bracket for 5" Pole	042254-1X
Side of Front of Mast Mounting Bracket (external wiring)	042256-X
Dwarf Mounting Base	042275-X
Side or Front of Mast Mounting Bracket (internal wiring)	042256-4X

Note: Top of mast mounting bracket must be ordered when using the internal wiring type side or front of mast mounting bracket.

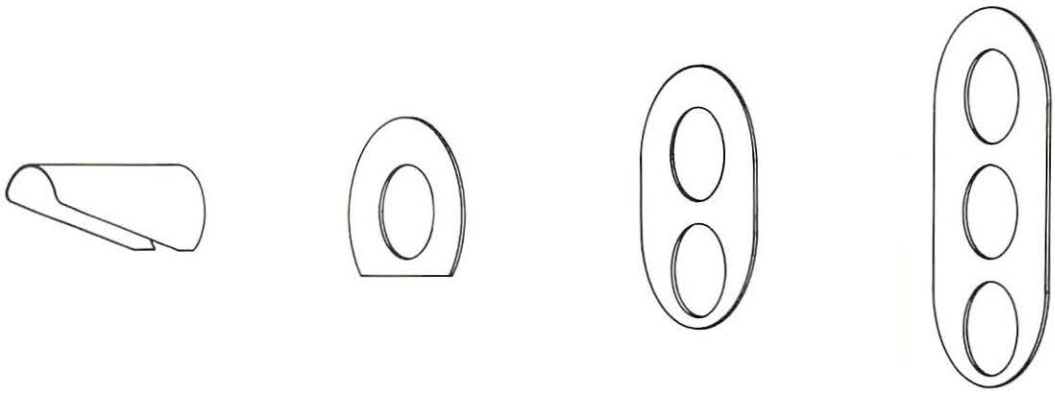
BACKGROUND AND VISORS FOR TYPE V



Material	Part Number	
	Background	Visor
Plastic	042250-304	042005-3AX
Steel	042250-346	042005-X1

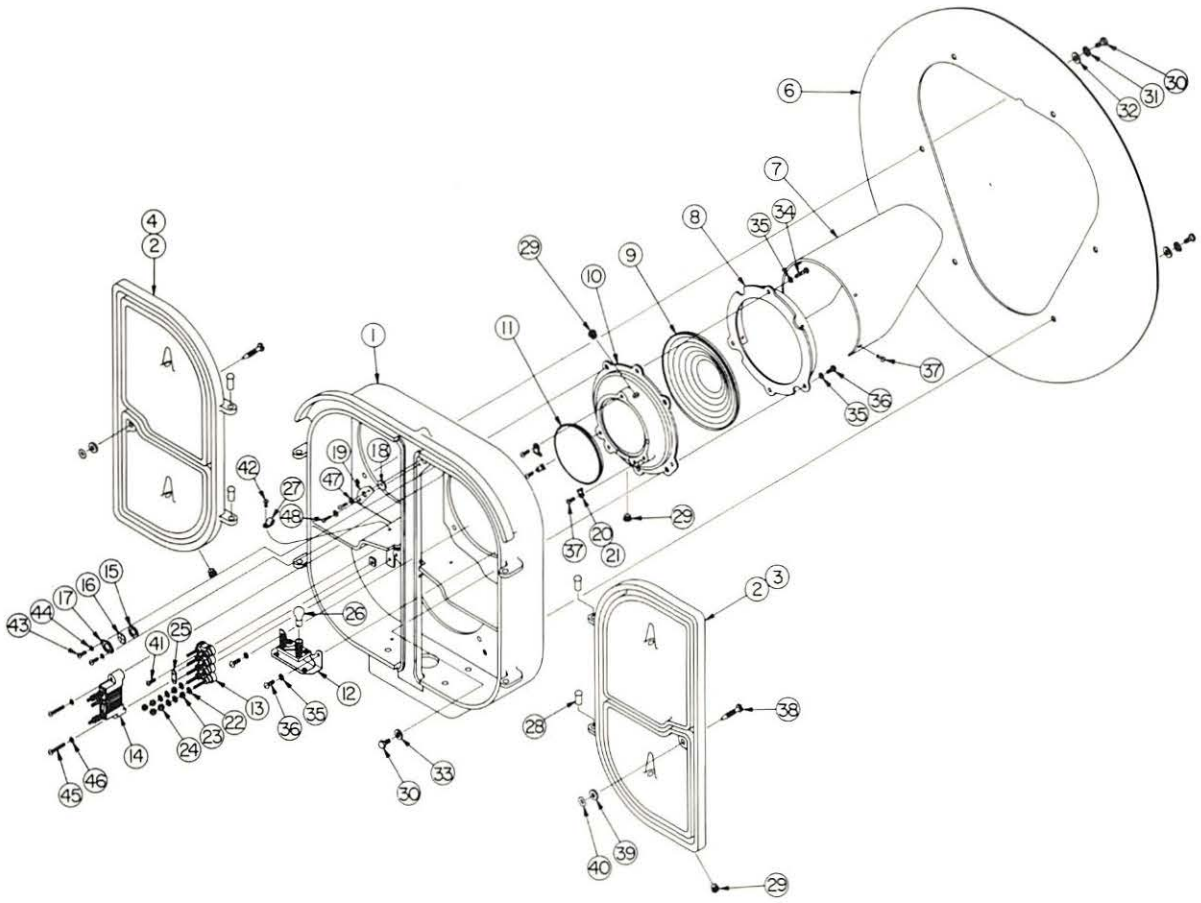
BACKGROUND AND VISORS FOR CLS-10

Background and Visors are available in black, high density, polyethylene plastic and steel painted black with non-reflecting surfaces. Background and Visor assemblies listed below include all appropriate mounting hardware.



Number of Lamp Head Units	Background			Visor		
	Plastic	Steel	Aluminum	Plastic	Steel	Aluminum
1	042267-7AX	042267-10X	042267-4X	042005-3AX	042005-X1	044018-X
2	042267-8AX	042267-X	042267-5X	042005-3AX	042005-X1	044018-X
3	042267-9AX	042267-1X	042267-6X	042005-3AX	042005-X1	044018-X

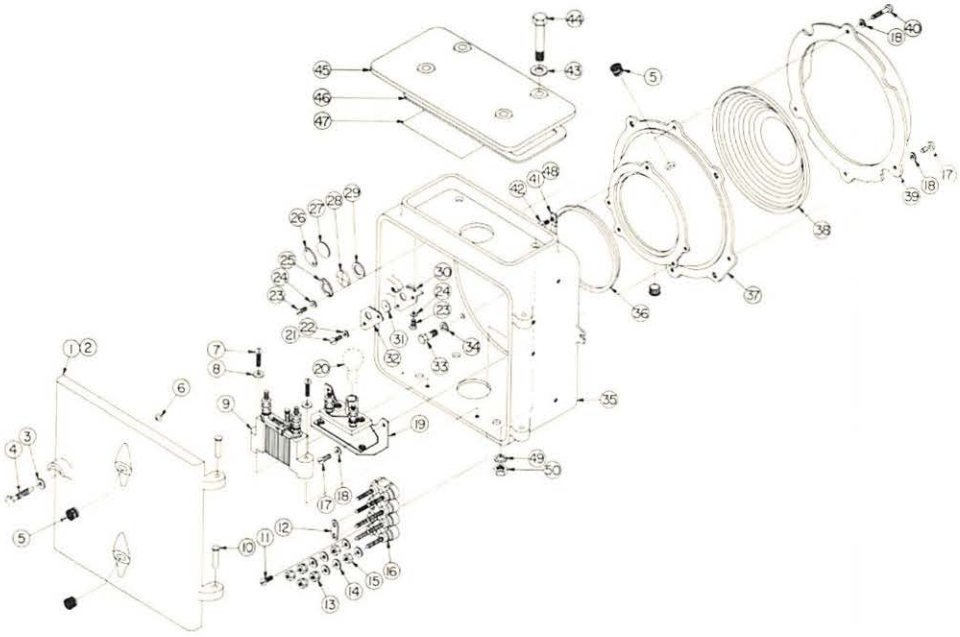
TYPE V COLOR LIGHT SIGNAL REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item No.	Description	Part Number	Qty. Req'd	Item No.	Description	Qty. Req'd	Part Number
1	Housing, Type V	042250-338	1	26	Bulb, (see page A-7-4)	3	Specify
2	Gasket, Door	104510	2	27	Clamp, Plastic	3	042279
3	Door, Right Hand	042250-335	1	28	Rivet, Round Head, 5/16" x 1.25"	4	3726-RA
4	Door, Left Hand	042250-337	1	29	Bushing, Vent	10	041913-X
5	Post, Center	042250-336	1	30	Cap Screw, Hex Head, 3/8" - 16 x .75"	18	4086-HSC
6	Background	042250-304	1	31	Washer, Spring Lock, M, 3/6"	6	1810-MSC
7	Visor	042005-3	3	32	Washer, Wrought, 3/8"	6	1753-C
8	Adapter, Lamp Hood	042259	3	33	Washer, Shakeproof Lock, I. 3/8"	12	1860-ISC
9	Lens, Outer Doublet, (see page C-12-2)	Specify	3	34	Screw, Long	15	042266
10	Housing, Lens	042257-14	3	35	Washer, Spring Lock, M, 1/4"	15	1808-MSC
11	Lens, Inner Doublet, (see page C-12-2)	Specify	3	36	Screw, Short	3	042266-1
12	Lamp Support Assembly	042265-10X	3	37	Machine Screw, Truss Head, #10-24 x .312"	21	2589-TE
13	Block, Terminal	023274-24X	4	38	Screw, Hex Locking	2	042056
14	Resistor, Adjustable	029603-2X	1	39	Washer, Cut	2	1722-C
15	Gasket	042261-3	1	40	O-ring	2	042380
16	Sight, Front	042260-4	1	41	Machine Screw, Round Head, #10-24 x .625"	4	2594-RSC
17	Retainer	042261-4	1	42	Machine Screw, Round Head, #10-24 x .25"	9	2588-RSC
18	Disc, Peep Sight	042260-3	1	43	Machine Screw, Round Head, #10-24 x .5"	2	2590-RSC
19	Plate, Hold Down	042261-1	1	44	Washer, Spring Lock, M, #10	8	1806-MSC
20	Clamp, Lens	042026	9	45	Machine Screw, Round Head, #10-24 x 1.5"	2	2600-RSC
21	Pad, Lens	042058-5	9	46	Washer, Flat, #10	2	1712-SC
22	Washer, Beveled	023834	24	47	Washer, Spring Lock, M, #8	12	1805-MSC
23	Nut, Clamp	023832	8	48	Machine Screw, Round Head, #8-32 x .375"	2	2572-RSC
24	Nut, Binding	023831	16				
25	Connector	023839-2	3				

MODEL CLS-10 COLOR LIGHT SIGNAL REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Door, CLS-10	1	042252	26	Plate, Cover	1	042261-5
2	Gasket, Door	1	104510	27	Gasket	1	042261-6
3	Washer, Flat, 5/16"	1	1722-E	28	Sight, Front	1	042260-4
4	Screw, Hex Locking	1	042056	29	Gasket	1	042261-3
5	Bushing, Vent	4	041913-X	30	Bracket, Rear	1	042262-1
6	O-Ring	1	042380	31	Disc, Peep Sight	1	042260-3
7	Machine Screw, Round Head, #10-24 x 1.5"	2	2600-RSC	32	Plate, Hold Down	1	042261-1
8	Washer, Flat, #10	2	1712-SC	33	Cap Screw, Hex Head, 3/8"-16 x .75"	4	4086-HSC
9	Resistor, Adjustable, 5 Ohm	1	029603-2X	34	Washer, Spring Lock, M, 3/8"	4	1810-MSC
10	Rivet, 5/6" x 1.25"	2	3726-RA	35	Housing, CLS-10	1	042251
11	Machine Screw, Round Head, #10-24 x .625"	2	2594-RE	36	Doublet, Inner (see page C-12-2)	1	Specify
				37	Housing, Lens	1	42257-1
12	Connector, Terminal	3	023839-2	38	Double, Outer (see page C-12-2)	1	Specify
13	Nut, Binding	16	023831	39	Adapter, Lamp Hood	1	042259
14	Washer, Beveled	24	023834	40	Screw, Retaining	1	042266-1
15	Nut, Clamp	8	023832	41	Clamp, Lens	3	042026
16	Block, Terminal	4	023274-24X	42	Machine Screw, Truss Head, #10-24 x .3125"	5	2589-TE
17	Screw, Retaining	5	042266				
18	Washer, Spring Lock, M, 1/4"	6	1808-MSC	43	Washer, Lead	4	042268-2
19	Support, Lamp	1	042265-10X	44	Cap Screw, Hex Head, 1/2"-13 x 2.75"	4	4173-HSC
20	Bulb (see page A-7-4)	1	Specify				
21	Machine Screw, Round Head, #8-32 x .375"	2	2572-RSC	45	Cap	1	042255
				46	Gasket	2	042268-1
22	Washer, Spring Lock, M, #8	2	1805-MSC	47	Gasket	1	042268
23	Machine Screw, Round Head, #10-24 x .5"	2	2592-RE	48	Pad, Lens Clamp	3	042058-5
				49	Washer, Spring Lock, M, 1/2"	4	1812-MSC
24	Washer, Spring Lock, M, #10	2	1806-ME	50	Nut, Hex, 1/2"-13	4	2108-SC
25	Retainer, Front Sight	1	042261-4				

Section D

Safetran

WAYSIDE SIGNAL CONTROL

SECTION D

CONTENTS

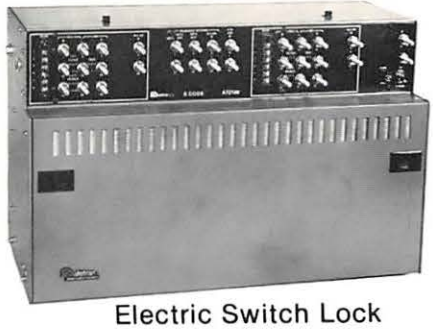
Product	Subsection
DC Coded Track Circuit — S Code — Microprocessor Based	1
DC Coded Track Circuit — S Code	2
Supervisory Control System — SCS Micro 128	3
Pulse Modulated Track Circuit (PMTC)	4
Series Overlay Track Circuit (SOTC)	5
Magnetic Detector and Relay Operator	6
Snow Detector	7
Loose Wheel Detector	8
High Water Detector	9
Dragging Equipment Detector	10
Electric Switch Lock	11
Switch Circuit Controller	12
Bridge Circuit Controller	13

Safetran

ELECTRONIC DC CODED TRACK CIRCUIT

S-CODE

Signal Control Unit
72170A



Electric Switch Lock
Release/Repeater Unit
72180

Repeater Unit
72190

S-Code is an all solid-state, electronic DC coded track circuit system providing train detection, signal aspect control, and block occupancy indications. Codes are normally transmitted through the rails to eliminate the need for line wire circuits. The system, however, is capable of transmitting over line wires where this mode may be desirable. Alternate eastward and westward transmission of codes provides bidirectional signal control. A dedicated and unique pulse pair address for each direction provides directional code identification. Parallel channel design is used to ensure a high level of system security.

A total of eight separate codes is available. Relay driver modules provide an output to front panel terminals for neutral or biased neutral control relays. These can be programmed to respond to either single or multiple codes. An approach lighting output terminal is available for direct connection to signal lamps without the use of external relay in most cases. Searchlight signal, or polar signal control relays can be directly controlled from the front panel terminals.

Receiver interface with the rails is accomplished through a built-in solid-state code follower, thus eliminating the requirement for mechanical code following relays.

Three additional modules are available for signal control assemblies. They are the stick control module, the approach lighting/1-6 relay driver module, and the series overlay track circuit module.

Maintenance and troubleshooting are greatly simplified by use of a test extender module. Test switches on the test module provide in-place diagnostic testing of the local receiver and transmitter. A portable, battery-operated code analyzer, which identifies address and codes on the rails anywhere in the circuit, is available to aid in troubleshooting.

A repeater unit to regenerate the code where blocks are long or where low ballast resistance is a concern is available, as well as a switch lock release/repeater unit to satisfy the requirements for electrically locked switches. S-Code carries U.S. Patent 4415134.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description		Part Number
S-Code Signal Control Unit		72170A
Contains:	Transmitter Program Plug	72162-70*
	Track Control Module	72171**
	Transmitter Module	72172
	Address Receiver Module	72173
	Code Receiver Module	72174
	Dual Relay Driver Module	72175-30
Case will accommodate but does not include:	Relay Driver Modules (3) (Any combination of single or dual relay drivers)	72175
	Stick Control Module	72176
	Approach Lighting/1-6 Driver Module	72178-30
	Series Overlay Track Circuit Module (SOTC)	7A190-f
	Non Vital Relay Driver Module	72175-78
	Approach Lighting Module	72178-10
S-Code Electric Switch Lock Release/Repeater Unit		72180
Contains:	Transmitter Program Plug (2)	72162-80*
	Track Control Module (2)	72171**
	Address Receiver Module (2)	72173
	Code Receiver Module (2)	72174
	Dual Relay Driver Module	72175-30
Case will accommodate but does not include:	Dual Relay Driver Module	72175-30
	Series Overlay Track Circuit Module (SOTC) OR Short Range Track Circuit Module (SMTC)	7A190-F OR 7A380-f
S-Code Repeater Unit		72190
Contains:	Track Control Module (2)	72171**

*Specify "A" or "B" address.
**Specify -1 if rail connected. Specify -2 if line connected.
SOTC frequencies (f) are 5900 or 10,000 Hz.
SRTC frequencies (f) are 10.0, 11.5, 13.2, 15.2, 17.5 and 20.2 kHz.

SPECIFICATIONS
SIGNAL CONTROL UNIT 72170A

Power Input:
12 VDC Nominal, 0.6 Amperes*
(Each additional Relay Driver Module, Part Number 72175, adds 0.2 Amperes.)

Weight:
37 pounds

Dimensions:
14 inches in height
22 inches in width
10 inches in depth

ELECTRIC SWITCH LOCK RELEASE/REPEATER UNIT 72180

Power Input:
12 VDC Nominal 1.2 Amperes*

Weight:
39 pounds

Dimensions:
14 inches in height
22 inches in width
10 inches in depth

REPEATER UNIT 72190

Power Input:
12 VDC Nominal, 0.75 Amperes*

Weight:
28 pounds

Dimensions:
14 inches in height
10-1/2 inches in width
10 inches in depth

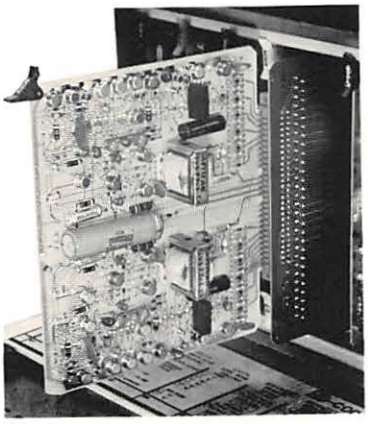
ALL UNITS

Temperature Range:
-40°C to 70°C (-40°F to 160°F)

*Will operate between 9.5 and 15 VDC.

Note: The above units have built-in surge protection for track and battery connections. They require only primary arresters and equalizers.

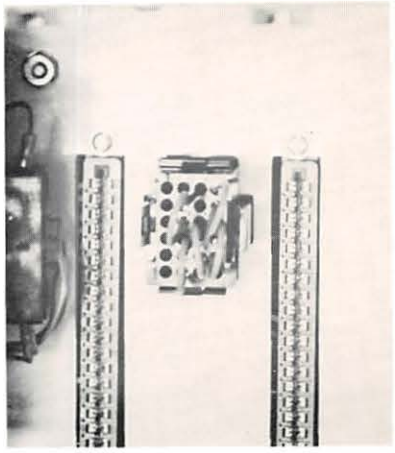
ACCESSORIES AND REPLACEMENT PARTS



Transmitter
Test Extender Module
72179

Portable Code Analyzer

72182



Code Transmitter
Program Plug
72162

Maintenance and troubleshooting are greatly simplified by use of a transmitter test extender module. The test extender module removes the S Code Signal Control Unit from active service. Test switches on the test module provide "in-place" diagnostic testing of the local receiver and transmitter. The test module permits the transmitter to "talk" to the receiver in the same 72170 unit, thereby converting the unit to a test set.

A portable battery-operated code analyzer, which identifies address and codes on the rails anywhere in the circuit, is available to aid in troubleshooting. This unit does not however, utilize "vital" circuit concepts and must be used as a diagnostic tool only.

To Order: Specify Description and Part Number.

Description	Part Number
HR Output Adapter	72139
"A" Transmitter Program Plug (use in 72170 unit only)	72162-70A
"B" Transmitter Program Plug (use in 72170 unit only)	72162-70B
"A" Transmitter Program Plug (use in 72180 unit only)	72162-80A
"B" Transmitter Program Plug (use in 72180 unit only)	72162-80B
Track Control Module (rail connected)	72171-1
Track Control Module (line connected)	72171-2
Transmitter Module	72172
Address Receiver Module	72173
Code Receiver Module	72174
Code 7 and Stick Relay Driver Modeul	72175-7S
Single Relay Driver Module (for codes 1, 3, 5, 7)	72175-10
Single Relay Driver Module (for codes 2, 4, 6, 8)	72175-20
Dual Relay Driver Module	72175-30
Non Vital Relay Driver Module	72175-78
Stick Control Module	72176
SOTC Module (see page D-2-2 for frequencies) (f)	7A190-f
Approach Lighting Module	72178-10
Approach Lighting/1-6 Driver Module	72178-30
Transmitter Test Extender Module	72179
Portable Code Analyzer	72182
SRTC Module (see page D-2-2 for frequencies) (f)	7A380-f

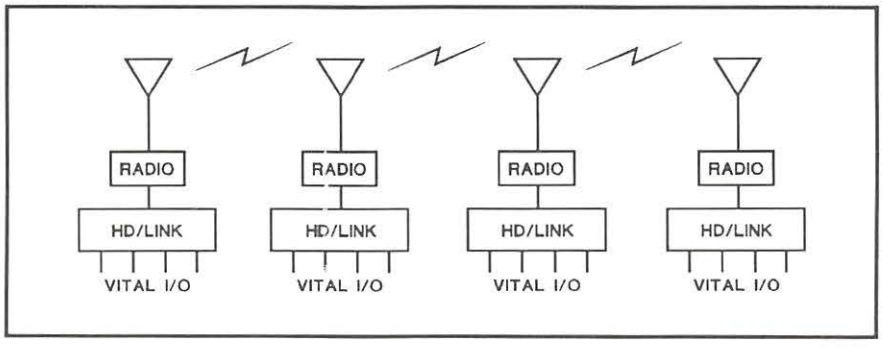
Safetran

HD/LINK™ MODULE, A53201

- LOW COST FOR POLE-LINE MAINTENANCE
- RECOVERS LOST SECTION OF POLE LINE IN NATURAL OCCURRENCES
- CREATES A 10-MILE VITAL CIRCUIT IN A HURRY
- SPANS A BRIDGE
- EASY CONNECTION TO SLIDE FENCES OR ELECTRIC LOCKS IN THE MIDDLE OF NOWHERE

Safetran's new vital HD/Link™ System is designed to cope with everyday problems in a simple, yet highly secure manner. In just a few hours, one or two people can replace a signal control line-wire circuit, covering distances up to 10 miles, with an HD/Link™ System. With multiple radio sites, greater distances can be achieved.

A typical HD/Link™ System consists of two or more HD/Link™ vital I/O modules and a suitable communications link such as Safetran's S³/Link™ Spread-Spectrum Radio, an ATCS network, or even dial-up modems. Site specific configuration is performed by field personnel in a matter of minutes, and then electronically validated and approved by a central design office or signal engineer. Optionally, fully configured HD/Link™ Modules can be supplied by Safetran.



Typical HD/Link™ System

Wayside Signal Controls

COMM B-1-6
SIGNAL D-2-6

Each HD/Link™ Module provides eight inputs and eight outputs that can be used to construct unipolar and bipolar bidirectional circuits. These circuits can be used in new installations in place of costly pole lines, or as direct replacements for existing line wire between any geographic locations.

Features of each HD/Link™ Module include:

- Eight fully isolated unipolar inputs combinable into four bipolar vital inputs
- Eight fully isolated unipolar outputs combinable into four bipolar vital inputs
- Outputs can directly drive vital signaling relays (100 to 1,000 ohms) or signal searchlight mechanisms
- Internal event recorder typically stores more than one week's data
- Local or remote diagnostics
- Status and diagnostic LED's to aid in troubleshooting
- Positive configuration management and enforcement
- Fully compatible with Safetran R/Link™ System's and S³/Link™ Spread-Spectrum Radios, as well as ATCS networks
- Spare modules are not site specific and do not require configuration before use

A railroad-maintained database of installed HD/Link™ circuits is used to avoid duplicate rf addressing. Safetran-supplied software provides direct or dial-up access to this database for validation of the proposed system design. Supplied software also performs system simulation to verify proper operation of the configuration. Once the configuration is verified, the software provides a printout containing hardware part numbers, ordering information, site wiring diagrams, and unique configuration data for each module. Safetran also offers assistance in system design and configuration management.

A software-generated electronic key (approval number) provided by the railroad's central design authority is stored at each site along with the site configuration data. This information is stored in an EEPROM housed in the HD/Link™ Module wiring connector and will only allow a properly configured module with the correct software version to function. This also permits maintenance personnel to replace a faulty HD/Link™ Module without reconfiguring the unit.

Operation of the HD/Link™ Module can be monitored locally with a laptop computer via the diagnostic port on the front of the unit or remotely from a network management system (optional). Diagnostic access is provided to note the communications error rates, event logs, troubleshooting test points, and other useful information.

SPECIFICATIONS

Input Power:	
Voltage	9.0 - 16.5 VDC; nominal 12 VDC
Current	1 ampere
Input Impedance:	1,000 ohms
Relay Drive:	Operates vital relay between 100 to 1,000 ohms coil resistance
Environmental:	
Temperature	-40° F to +160° F (-40° C to +71° C)
Humidity	95% noncondensing
Housing:	
Package	Black powder coat metal
Dimensions	11.3 inches (28.7 centimeters) high, including connector and mounting tab 3.6 inches (9.1 centimeters) wide 9.6 inches (24.4 centimeters) deep
Weight	4 pounds (1.8 kilograms) (approximate)
Mounting:	Relay rack or wall

ORDERING INFORMATION

To order, specify: HD/Link™ Module, Part No. A53201

COMM B-1-8
SIGNAL D-2-8

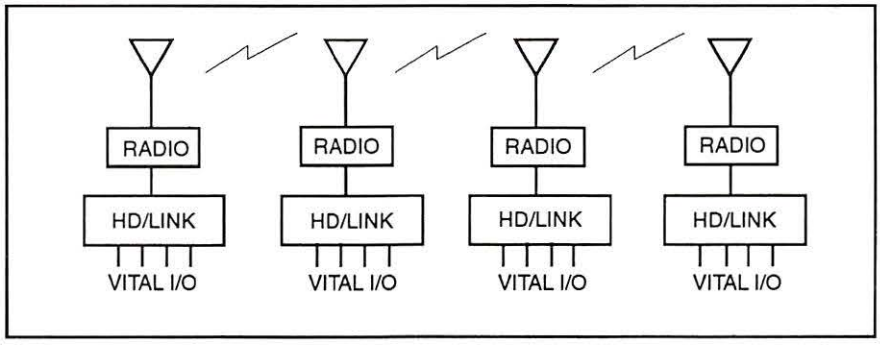
HD/LINK™ MODULE

A53201

- LOW COST FOR POLE-LINE REPLACEMENT
- REPLACES LOST SECTION OF POLE LINE
- CREATES A 10-MILE VITAL CIRCUIT IN A HURRY
- SPANS A BRIDGE
- EASY CONNECTION TO SLIDE FENCES OR ELECTRIC LOCKS IN THE MIDDLE OF NOWHERE

Safetran's new vital HD/Link™ System is designed to cope with everyday problems in a simple, yet highly secure manner. In just a few hours, one or two people can replace a signal control line-wire circuit, covering distances up to 10 miles, with an HD/Link™ System. With multiple radio sites, greater distances can be achieved.

A typical HD/Link™ System consists of two or more HD/Link™ vital I/O modules and a suitable communications link such as Safetran's S³/Link™ Spread-Spectrum Radio, an ATCS network, or even dial-up modem. Site specific configuration is performed by field personnel in a matter of minutes, and then electronically validated and approved by a central design office or signal engineer. Optionally, fully configured HD/Link™ Modules can be supplied by Safetran.



Typical HD/Link™ System

Each HD/Link™ Module provides eight inputs and eight outputs that can be used to construct unipolar and bipolar bidirectional circuits. These circuits can be used in new installations in place of costly pole lines, or as direct replacements for existing line wire between any geographic locations.

Features of each HD/Link™ Module include:

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- Eight fully isolated unipolar outputs combinable into four bipolar vital outputs
- Outputs can directly drive vital signaling relays (100 to 1,000 ohms) or signal searchlight mechanisms
- Internal event recorder typically stores more than one week's data
- Local or remote diagnostics
- Status and diagnostic LED's to aid in troubleshooting
- Positive configuration management and enforcement
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- Spare modules are not site specific and do not require configuration before use

A railroad-maintained database of installed HD/Link™ circuits is used to avoid duplicate rf addressing. Safetran-supplied software provides direct or dial-up access to this database for validation of the proposed system design. Once the configuration is verified, the software provides a printout containing hardware part numbers, ordering information, site wiring diagrams, and unique configuration data for each module. Safetran also offers assistance in system design and configuration management.

A software-generated electronic key (approval number) provided by the railroad's central design authority is stored at each site along with the site configuration data. This information is stored in an EEPROM housed in the HD/Link™ Module wiring connector and will only allow a properly configured module with the correct software version to function. This also permits maintenance personnel to replace a faulty HD/Link™ Module without reconfiguring the unit.

Operation of the HD/Link™ Module can be monitored locally with a lap-top computer via the diagnostic port on the front of the unit or remotely from a network management system (optional). Diagnostic access is provided to note the communications error rates, event logs, troubleshooting test points, and other useful information.

SPECIFICATIONS

Input Power:	
Voltage	9.0 - 16.5 VDC; nominal 12 VDC
Current	1 ampere
Input Impedance:	1,000 ohms
Relay Drive:	Operates vital relays between 100 to 1,000 ohms coil resistance
Environmental:	
Temperature	-40° F to +160° F (-40° C to +71° C)
Humidity	95% noncondensing
Housing:	
Package	Black powder-coat metal
Dimensions	11.3 inches (28.7 centimeters) high, including connector and mounting tab 3.6 inches (9.1 centimeters) wide 9.6 inches (24.4 centimeters) deep
Weight:	4 pounds (1.8 kilograms) approximate
Mounting:	Relay rack or wall

ORDERING INFORMATION

To Order Specify:

HD/Link™ Module, Part No. 9000-53201-00XX

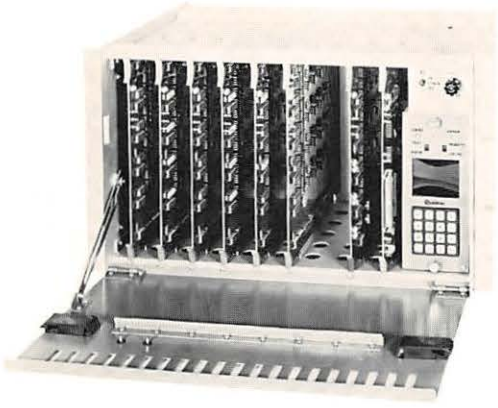
Number of circuits
- 4 = 4 I/O circuits
- 8 = 8 I/O circuits

Connector (A53013-01)
- 0 = Not included
- 1= Included

COMM B-1-8
SIGNAL D-2-8

Safetran

SUPERVISORY CONTROL SYSTEM SCS MICRO 128



- MICROPROCESSOR-BASED CONTROLLER
- CAPABLE OF SENDING AND RECEIVING DATA FROM 125 REMOTES
- VARIABLE OPERATING SPEEDS FROM 75 TO 2400 BAUD
- SPECIAL APPLICATIONS

The SCS Micro 128 Supervisory Control System is a highly secure microprocessor-based controller which has primary application in railroad supervisory signal control systems. Control and indication data is passed between a central control unit and up to 125 remote locations. Each remote is capable of handling up to 192 controls and indications. The system is completely under program control permitting future applications or enhancements to be easily accommodated without redesign of hardware circuits.

The office unit accepts manual or computer-generated control inputs and transmits these to the appropriate remote station. The remotes transmit verification of received commands and status of desired events back to the office for visual indication, or to initiate further control functions. Data interface is EIA RS-232C. Modems are required for line interface.

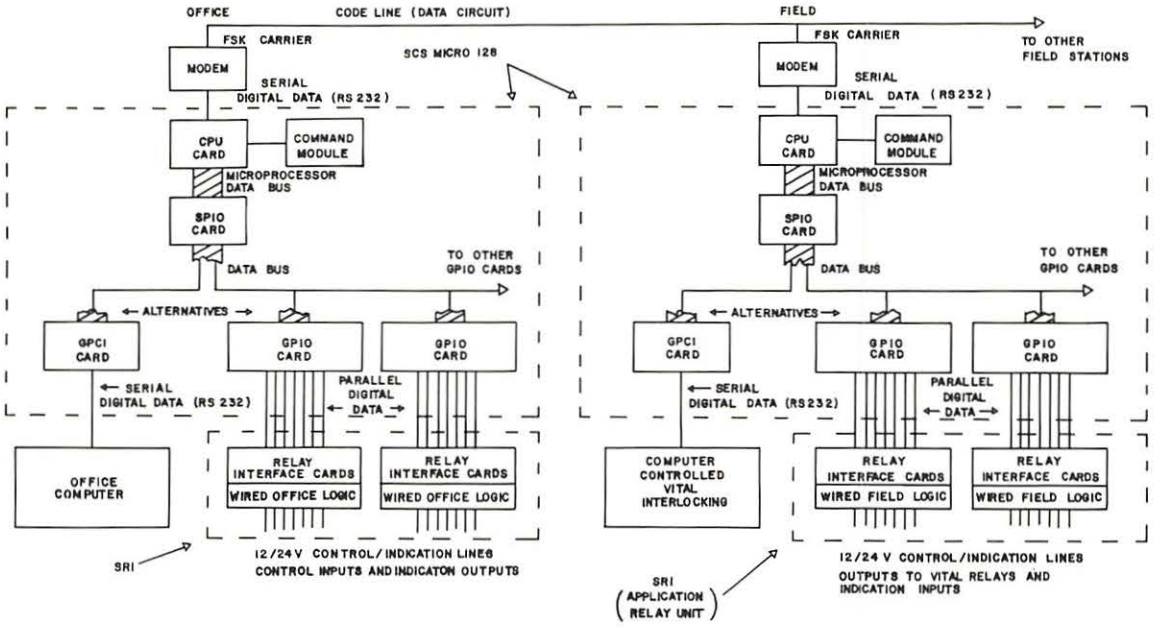
The system starts up on the 75 baud transmission rate and after establishing contact with all remote units, automatically switches to the baud rate selected — 150, 300, 600, 1200, or 2400 baud. The system can be switched back to the 75 baud rate to allow operation on marginal or noisy circuits.

The basic SCS Micro 128 unit for both office and remote applications consists of a Power Module, Central Processing Unit (CPU) Module, Special Purpose Input Output (SPIO) Module, and at least one General Purpose Module. General Purpose Modules consist of three types which are Input Output (GPIO) Modules, Relay Output (GPRO) Modules, and the Communications Interface (GPCI) Module. Only the EPROM programming differs in office and remote unit modules.

An SRI Relay Interface Unit provides the required interface between the SCS Micro 128 unit and the field signal/control systems. The SRI Relay Interface takes the low level parallel output from the SCS Micro 128 unit and provides a high level parallel output to drive field relays. Also, the SRI Interface provides the required field or office logic, customized to each application. When the SCS Micro 128 is used to interface to computer-based office or field systems, the SRI Interface is not required as data communication is serial.

The system incorporates several built-in dynamic self-checking capabilities. The CPU Module contains a "watchdog" circuit which causes the microprocessor to halt when the program is not being executed properly. Also, all modules have LED indicators which light in the event of module failure. When the Control Module is installed, the LED readout will indicate the module, the subassembly unique to that module, and in most cases, the specific component or group of components which are causing the failure.

TYPICAL SCS MICRO 128/SRI APPLICATION



SPECIFICATIONS

Power Requirements:	10 to 36 VDC; Less than 1 A Average at 12 VDC; Less than 0.5 A Average at 24 VDC
Power Supply Isolation:	2500 VDC (Input Voltage to Logic Ground)
Voltage Supplied to External Modem:	± 12 VDC
Current Available for External Modem:	250 mA at Both Outputs
Operating Temperature:	-40 °C to + 70 °C. -40 °F to + 160 °F.
Dimensions:	Height: 10-1/2 Inches Width: 19 Inches (Rack Mounting) Depth: 12-1/2 Inches
Weight:	18 Pounds

ORDERING INFORMATION

To Order: Contact a Safetran Sales Representative or the Safetran Electronics Division, Cucamonga, California

ACCESSORIES AND REPLACEMENT PARTS SCS MICRO 128

To Order: Specify Description and Part Number.

Description	Part Number
SCS-128 Chassis	50096
Power Module P.C. board only	50101
CPU Module, with battery	50102-1
CPU Module, without battery Standard option	50102-2
SP I/O Module, with 12 v relays, Use with GP10	50103-1
SP I/O Module, with 24 v relays, Use with GP10	50103-2
SP I/O Module, with 12 v relays, Use with GPPI	50103-3
SP I/O Module, with 24 v relays, Use with GPPI	50103-4
GP I/O Module, w/10 ohm Res. I/O (Bidirectional) (Negative Input)	50104-1
GP I/O Module, w/diode I/O (Uni-directional) (Negative Input)	50104-2
Control Module	50105
Power Module Assy. for 12 VDC	50107-1
Power Module Assy. for 24 VDC	50107-2
GPRO Module, 12 v relays	50112-1
GPRO Module, 24 v relays	50112-2
GPRO Module, 12 v relays	50112-3
GPRO Module, 24 v relays	50112-4
GPCI (Com. Interface)	50115-1
GPPI Module, Bidirectional (Positive Input)	50116-1
GPPI Module, Uni-directional (Positive Input)	50116-2
Extender Module	50119

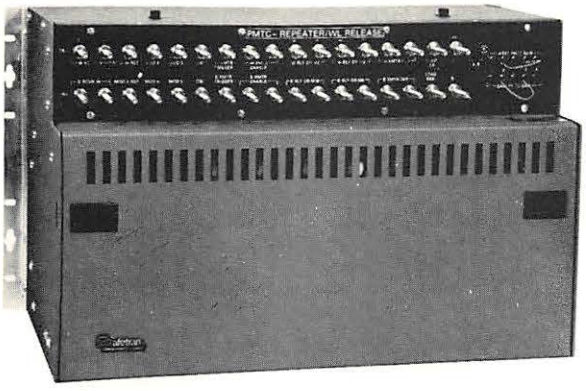
SRI RELAY INTERFACE

To Order: Specify Description and Part Number.

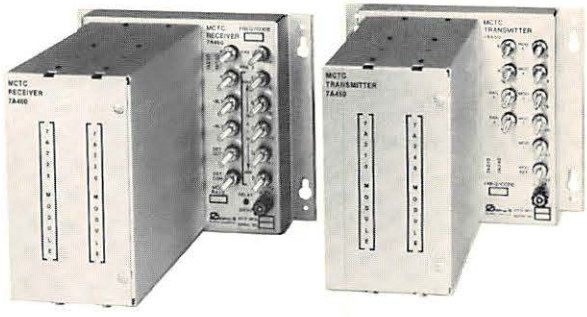
Description	Part Number
SRI Chassis, with barrier terminals	50098-1
SRI Chassis, with 50 pin cable connector	50098-2
Relay Output Module, 12 v Relays	50111-1
Relay Output Module, 24 v Relays	50111-2
Relay Stick Module, 12 v Relays	50113-1
Relay Stick Module, 24 v Relays	50113-2
Relay Repeater, 12 v Relays	50114-1
Relay Repeater, 24 v Relays	50114-2
Diode Resistor Module	50117
Extender Module	50119
Location Module	50124
Relay Select	50125
Relay I/O Module, 12 v Relays	50126-1
Relay I/O Module, 24 v Relays	50126-2
Relay Code Word Module, 12 v Relays	50127-1
Relay Code Word Module, 24 v Relays	50127-2
Dual Flasher Annunciator Module, 12 V Relays	50128-1
Dual Flasher Annunciator Module, 24 V Relays	50128-2
Dual Flasher Annunciator Module, 12 V Relays	50128-3
Dual Flasher Annunciator Module, 24 V Relays	50128-4

Safetran

PULSE MODULATED TRACK CIRCUIT



Pulse Modulated Track Circuit



Modulated Coded Track Circuit

The Pulse Modulated Track Circuit (PMTC) is a highly secure audio frequency pulse coded system used to provide a basic track detection circuit and/or aspect control for automatic block signal and CTC signal systems. The system operates without the use of line wires and with or without insulating joints. Coded, precisely timed bursts of audio frequency energy are transmitted through the rails in both directions simultaneously having both "signature" and control information.

The receivers respond to transmitted information of the proper frequency and code, and supply a DC output voltage to operate appropriate signal or control relays. The signal level on long track circuits may be regenerated by repeaters located at intermediate points. The PMTC may be used simultaneously with various types of audio frequency overlay track circuits, with the proper application design.

Modulation consists of pulse-pair spacing. The spacing, or timing interval between pulse pairs and between pairs of pulses provides up to 5 high-security modulation rates for control of up to 6 signal aspects or functions.

Several configurations of PMTC equipment are available for occupancy detection only, or signal aspect control as well. These can be installed as jointless track circuits or with insulated joints in either diesel or electrified territory. PMTC can provide signal aspect control overlayed on DC or AC detection circuits. The Modulated Coded Track Circuit (MCTC) is a variation which is used to supply track occupancy and broken rail/open bond information only. It can be used where DC or AC track circuits are present and in electrified territory.

When transmitting PMTC signal aspect control signals over DC detection circuits, the maximum operating distance at 4 ohms/1000 feet is 16,000 feet. For track circuits up to 5000 feet at 4 ohms/1000 feet ballast resistance in electrified territory, inductive coupling may be used to the rails for use without insulated joint operation. Rail coupling may be by means of rail current couplers or wire loops located at ends of the track circuit. A total of 12 operating frequencies is available.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description		Part Number
PMTC-Signal Control, Electrified Track		7A200-13
Contains:	Transmitter Module	7A210-f-x
	Receiver Module	7A220-f-x
	Demodulator Module	7A230
Case will accommodate but does not include:	Additional Demodulators (5)	7A230
PMTC-Electric Switch Lock Release (with insulated joints)		7A200-15-2
Contains:	Transmitter Modules (2)	7A210-f-x
	Transmitter Adaptor	7A212
	Receiver Modules (2)	7A220-f-x
	Transmitter Shunts (2)	7A240-f
	Multi-Channel Demodulator (2)	7A260
Case will accommodate but does not include:	Short/Medium Range Track Circuit Module	7A380-f
PMTC-Signal Control		7A200-22
Contains:	Transmitter Module	7A210-65-f-x
	Receiver Module	7A220-51-f-x
	Demodulator Module	7A230
	Transmitter Shunt	7A240-65-f
Case will accommodate but does not include:	Additional Demodulators (4)	7A230
	Approach Lighting Relay Driver	7A242
	PSO Transmitter Module	7A411-f
	PSO Receiver Module	7A416-f
PMTC-Repeater/WL Control		7A200-23
Contains:	Transmitter Modules (2)	7A210-65-f-x
	Transmitter Adaptor	7A212
	Receiver Modules (2)	7A220-51-f-x
	Transmitter Shunts (2)	7A240-65-f
Cases will accommodate but does not include:	Additional Multi-Channel Demodulators (4)	7A260
PMTC-Signal Control		7A200-31
Contains:	Transmitter Module	7A210-f-x
	Receiver Module	7A220-f-x
	Demodulator Module	7A230
	Transmitter Shunt	7A240-f
	6-Volt Regulator Module	7A264
Case will accommodate but does not include:	Additional Demodulator Modules (5)	7A230
	Additional Multi-Channel Demodulator Module	7A260
MCTC-Transmitter		7A450
Contains:	Transmitter Module	7A210-f-x
	Transmitter Shunt	7A240-f
MCTC-Receiver		7A460
Contains:	Receiver Module	7A220-f-x
	Demodulator Module	7A230-1 to 5

Specify: frequency (f) and pulse pair spacing (x) from tables on page D-4-3.

ORDERING INFORMATION
(Continued)

Pulse Modulated Track Circuit Frequencies (Hz):
156, 211, 285, 348, 430, 525, 645, 790, 970, 1180, 1450, 1770

Medium Range Track Circuit Frequencies (Hz):
2140, 2630, 3240, 4000, 4900, 5900, 7100, 8300

Short Range Track Circuit Frequencies (Hz):
10.0, 11.5, 13.2, 15.2, 17.5, 20.2

In addition to the above, specify:

For Transmitter and Receiver (same at both ends of circuit):
Pulse Pair Spacing: A(130 ms), B(230 ms), or C(330 ms)

For Demodulator:
Modulation Rate: Channel 1(1.0 sec.), 2(.87 sec.), 3(.77 sec.), 4(.67 sec.), or 5(.57 sec.), or Multi-Channel.

Drop-out: Slow (3 to 4 seconds) is provided unless fast (1 to 2 seconds) is specified.

SPECIFICATIONS

Dimensions:
PMTC: 14 inches high
10 inches deep
22 inches long (shelf-mounted)
24 inches long (wall-mounted)

MCTC: 8-3/4 inches high
9-7/8 inches wide
9-1/2 inches deep

Weight:
PMTC: 35 pounds (approximate)
MCTC: 5 pounds

Temperature Range:
-40°F to +160°F
(-40°C to +57°C)

Power Input:
11 to 15 VDC
1.2 to 2.0 Amperes (Each chassis depending upon number of modules)

Output Voltage:
Pulse between 0.25 volt rms and 2.0 volts rms, depending upon frequency and ballast conditions

Operating Frequencies:
156, 211, 285, 348, 430, 525, 645, 790, 970, 1180, 1450 and 1770 Hz.

Frequency Tolerance:
±1 percent

PULSE MODULATED TRACK CIRCUIT ACCESSORIES AND REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Description	Part Number
Battery Choke — Burial Type	7A066
Battery Choke — Shelf-Mount Type	7A067
PMTC Transmitter Module	7A210-65-f-x
PMTC Transmitter Adaptor Module	7A212
PMTC Receiver Module	7A220-51-f-x
PMTC Demodulator Module	7A230-X
PMTC Transmitter Shunt Module	7A240-55-f
PMTC Transmitter Shunt Module	7A240-65-f
PMTC Multiple Channel Demodulator	7A260-1-X
6-Volt Regulator	7A264
Inductive Coupler (Bootleg Installation)	7A267-1
Inductive Coupler (Burial Type)	7A267-2
Tuned Receiver Coupler	7A284A-f
PMTC Receiver Detector Test Meter	7A291
Extender Module	62516
Short/Medium Range Track Circuit Module	7A380-f
Series Overlay Track Circuit	7A190-f
Rail Current Coupler (1000 Turn Coil)	011400-X
Rail Current Coupler (300 Turn Coil)	011400-1X
Tuned Coupler Unit	7A282-X

The following accessories are used as required with PMTC Systems on Electrified Track:

PMTC Receiver	7A220-01
Track Loading Coil	7A265
Power Amplifier	7A401
Track Loading Coil	7A433

Note: See table of available frequencies (f) and pulse pair spacings (x) on preceding page

Safetran

SERIES OVERLAY TRACK CIRCUIT

- ADJUSTABLE LENGTH AUDIO FREQUENCY TRACK CIRCUIT
- NORMALLY DE-ENERGIZED RELAY OPERATION
- TWO-WIRE RAIL CONNECTION

Series Overlay Track Circuit (SOTC) is an adjustable length audio frequency track circuit intended primarily for obtaining release of electrically locked switches (through a normally de-energized external relay) by occupying the main track immediately ahead of the switch points. Three frequencies, 5900 Hz, 10.0 kHz and 26.0 kHz are available. Except for primary arresters, no external surge protection devices are required.

The SOTC is a compact unit, containing both transmitter and receiver on one plug-in printed circuit module. The PC module is available separately for use in certain PMTC electric switch lock release chassis.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Series Overlay Track Circuit (Complete)	7A191-1-f
Series Overlay Track Circuit Complete with Safetran Type ST Relay Rack Mounting Bracket	7A191-2-f
Series Overlay Track Circuit (Module Only)	7A190-f

Specify Frequency (f): Either 5900 Hz, 10.0 kHz or 26.0 kHz

SPECIFICATIONS

Dimensions:
- 9-1/4 inches high
- 7-1/2 inches wide
- 8-3/4 inches deep

Weight:
- 11 pounds

Temperature Range:
- −40° to +160° F

Input:
- Voltage - 9.5 VDC minimum
  15.0 VDC maximum
- Current - 350 mA maximum

Shunting Zone (Releasing Section):
- Adjustable up to 150 feet on each side of track connections

Relay Drive:
- Operates any relay with coil resistance from 6 ohms to 1000 ohms

Safetran

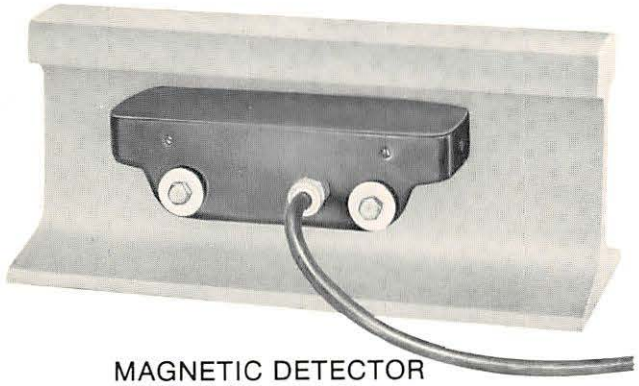
MAGNETIC DETECTOR

MODEL MD-10

AND

RELAY OPERATOR

MODEL RO-12/24



MAGNETIC DETECTOR

RELAY OPERATOR

The Model MD-10 Magnetic Detector is a magnetic contactor biased by a permanent magnetic field. When the field is disturbed by a steel wheel in the required proximity, the contactor circuit is opened. The unit is enclosed in a phenolic block with a sealed neoprene cover. A two conductor insulated cord provides connection to the contactor.

The Model RO-12/24 Relay Operator is a solid state unit designed to match the magnetic detector to a standard signal relay on 12 or 24 VDC. The Relay Operator, when connected between the detector and repeating relay, performs two functions. First, it lengthens in effect the operating time of the magnetic detector by about one second, providing a sufficiently long pulse to the relay so that it becomes fully energized under all conditions. Secondly, the highly inductive load of the relay is removed from the detector contacts; assuring long contact life.

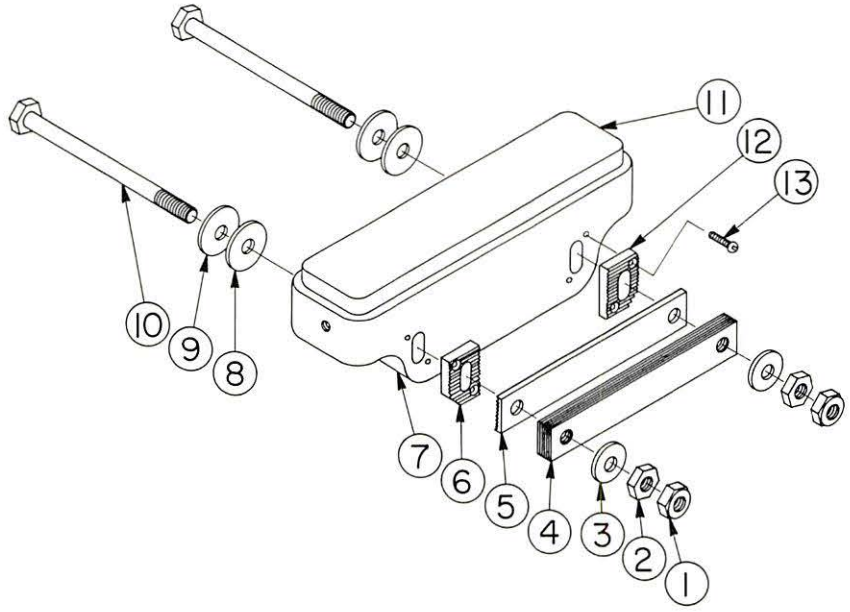
The MD-10 is intended for grade crossing restarts and other non-vital signal circuits. While it is highly reliable when properly adjusted, it should not be used where accurate wheel counts are required.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

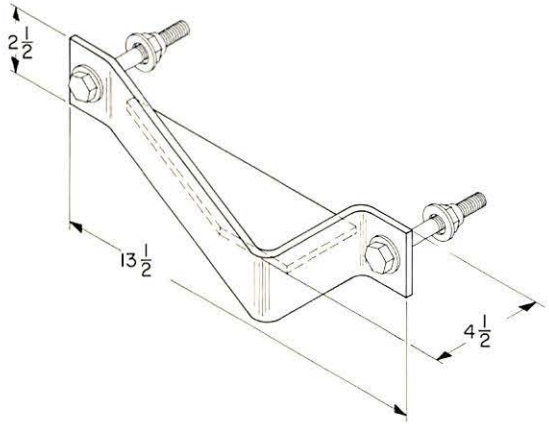
Description	Part Number
Magnetic Detector and Relay Operator	012002-X
Model MD-10 Magnetic Detector	012000-X
Model RO-12/24 Relay Operator	010913-X

MAGNETIC DETECTOR REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number
1	Nut, Stop, 3/8"-24	2	2369-SC
2	Nut, Hex, 3/8"-24	2	2105-E
3	Washer, Flat, 3/8"	2	1726-SC
4	Link	6	012000-10
5	Plate, Support	1	012000-9
6	Bracket, Adjustment	1	012000-11
7	Body, Molded Phenolic	1	012000-1
8	Washer, Neoprene	2	012000-8
9	Washer, Flat, 1.625" x .375"	2	1963-SC
10	Cap Screw, Hex Head, 3/8"-24 x 5.5"	2	4124-HE
11	Cover, Molded Neoprene	1	012000-2
12	Bracket, Adjustment	1	012000-12
13	Machine Screw, Fillister Head, #8 - 32 x .625"	4	2576-LSC



DEFLECTOR FOR MAGNETIC DETECTOR

Where is it desirable to protect the magnetic detector, a deflector is suggested. One deflector is normally used on each side of the detector. Dimensions shown in illustration at left are in inches.

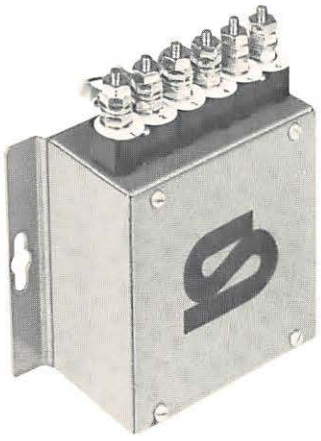
To Order: Specify Magnetic Detector Deflector and Part Number 012003-X

Safetran

SNOW DETECTOR

MODEL SD-10-1

DETECTOR UNIT



CONVERSION UNIT

AMBIENT THERMOSTAT

The Model SD-10-1 Snow Detector detects snow by melting it to develop water which bridges a gap between two plates, decreasing the resistance of the gap. An ambient temperature thermostat detects below freezing termperatures to differentiate rain and snow. It operates on signal battery voltage (with the exception of the heater).

The Snow Detector consists of three separate parts: the Detector Unit, the Conversion Unit, and the Ambient Thermostat.

The Detector Unit consists of two stainless steel grids, two heaters and a thermostat. The heaters are provided to melt snow for detection purposes and maintain a temperature of about 50° F inside the unit. A minute quantity of water between the plates is adequate to cause detection.

The Conversion Unit is a solid state device which serves to convert a resistance between the plates caused by the presence of water into a sufficient current to energize a signal line relay.

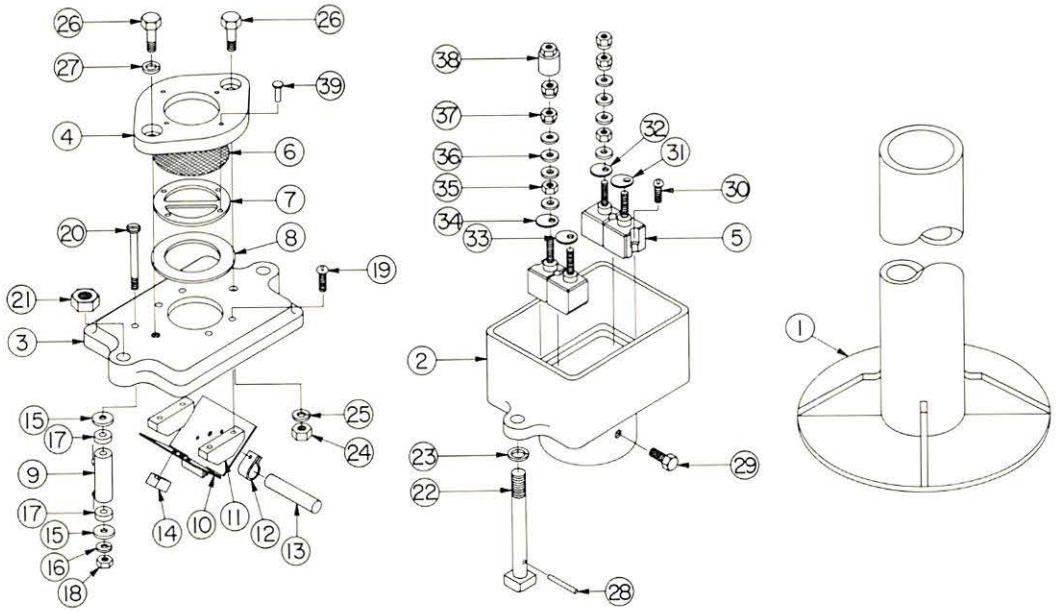
The Ambient Thermostat acts to turn the snow detector on when the temperature falls to the desired level. This control is required to prevent the unit from responding to rain as well as snow.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Snow Detector Assembly with 110 VAC Heater	012100-X
Snow Detector Assembly with 220 VAC Heater	012100-3X
Detector Unit with 110 VAC Heater	012101-3X
Detector Unit with 220 VAC Heater	012101-3X
Conversion Unit	012102-X
Ambient Thermostat	012100-1

SNOW DETECTOR REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Pedestal	1	093313-7	21	Nut, Hex, 1/2"-13	2	2108-SC
2	Box	1	012105-1	22	Bolt, 1/2"-13 x 4.5"	2	012105-2
3	Cover	1	091463-9	23	Washer, Spring Lock, M, 1/2"	2	1812-MSG
4	Plate	1	012106-1	24	Nut, Esna, 5/16"-18	1	2374-SZ
5	Block, Terminal	4	023390-14X	25	Washer, Spring Lock, M, 5/16"	1	1809-MSC
6	Screen	1	012106-2	26	Cap Screw, Head Head, 5/16"-18 x .75"	2	4044-HZ
7	Retainer	1	012106-3X				
8	Gasket	1	012106-4	27	Washer, Spring Lock, M, 5/16"	1	1809-MSC
9	Resistor, 2500 Ohm	1	019601-16	28	Pin, Roll, .125" x 1.375"	2	1561-SC
10	Grid	2	012104-3	29	Cap Screw, Hex Head, 3/8"-16 x .625"	3	4085-HZ
11	Block	2	012104-2				
12	Nyloclip	2	042279	30	Machine Screw, Fillister Head, 1/4"-20 x .75"	4	2660-LBN
13	Thermostat	1	012104-6				
14	Resistor, 750 Ohm	1	019601-3	31	Tag, Vinyl, #4	1	024359-34
15	Washer, Flat, #8	11	1707-SC	32	Tag, Vinyl, #3	1	024359-33
16	Washer, Spring Lock, M, #8	4	1805-MSC	33	Tag, Vinyl, #1	1	024359-31
17	Spacer	2	012104-4	34	Tag, Vinyl, #2	1	024359-32
18	Nut, Hex, #8-32	4	2012-SC	35	Nut, Clamp	4	023832
19	Machine Screw, Fillister Head, #8 - 32 x .5"	4	2574-FSC	36	Washer, Beveled	16	023834
				37	Nut, Binding	8	023831
20	Machine Screw, Fillister Head, #8 - 32 x 2.5"	1	2585-PSC	38	Nut, Insulated	2	023408-1X
				39	Rivet, Flat Head, 5/32" x .5"	4	3535-FSC

Safetran

AC STEADY ENERGY TRACK CIRCUIT

MODEL SE-3

Model SE-3 100 Hz Receiver

SE-3 Code Reset Unit

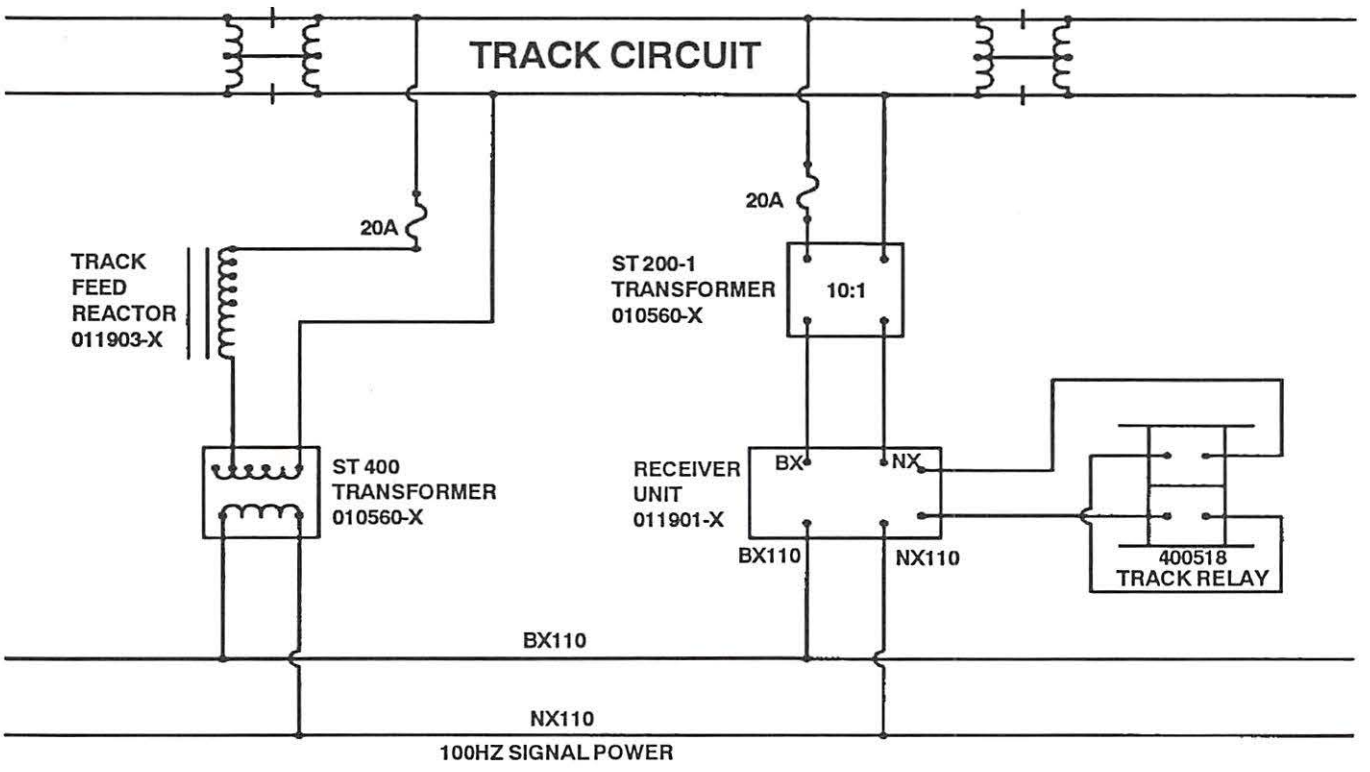
- **AVAILABLE FOR USE WITH 60, 91-2/3, 100 Hz TRACK CIRCUIT FREQUENCIES**
- **REJECTS DC AND 25 AND 60 Hz TRACTION**
- **NO ACTIVE ELECTRONICS IN RECEIVER**
- **ELECTRICALLY COMPATIBLE WITH TRU-II SYSTEMS**
- **CONFORMS TO AAR RECOMMENDED PRACTICES**

The Safetran SE-3 AC Steady Energy Track Circuit is designed for use in environments where traction or other severe EMI currents might interfere with signal circuits. The receiver has a very high capability to reject interference from traction currents. Applications include vane or centrifugal relay replacements; however, the SE-3 has no moving parts and requires no regular maintenance. It is entirely a passive component design, utilizing no active electronic circuits. All components are of the highest reliability to ensure long life over the entire -40° C to +71° C temperature range. The receiver features excellent capability to detect shunting, broken rails and failed insulated joints. This track circuit is compatible with coded cab signal systems. A code reset unit resets the track feed to steady energy after the block is cleared.

The SE-3 AC Steady Energy Track Circuit components are:

Transmitter:
- ST-400 Transformer
- ST-7 or ST-8 Track Feed Reactor

Receiver:
- ST 200-1 Track Transformer
- Receiver Unit (60, 91-2/3 or 100Hz)
- ST 400518 Track Relay



SPECIFICATIONS

Track Circuit Length:	8,000 feet maximum at 3 ohms per 1,000 feet ballast resistance
Outputs:	The receiver has one output to drive a special 2 ohm ST track relay
Frequency:	60, 91-2/3 or 100 Hz ± 2 Hz
Shunting Sensitivity:	0.25 ohm shunt
Line Voltage:	110 VAC nominal. Local input is regulated from 90 to 125 VAC
Physical:	Receiver and other components mount on a vital relay rack or backboard
Temperature:	-40° C to +71° C (-40° F to +160° F)
Receiver Unit:	
Size:	8.25 inches (20.96 centimeters) high 4.75 inches (12.07 centimeters) wide 8.50 inches (21.6 centimeters) deep
Weight:	14 pounds

SPECIFICATIONS (CONT.)

Code Reset Unit:

Size:	8.25 inches (20.96 centimeters) high 1.75 inches (4.45 centimeters) wide 8.25 inches (20.96 centimeters) deep
Weight:	3 pounds

ORDERING INFORMATION

To Order: Specify Description and Part Number

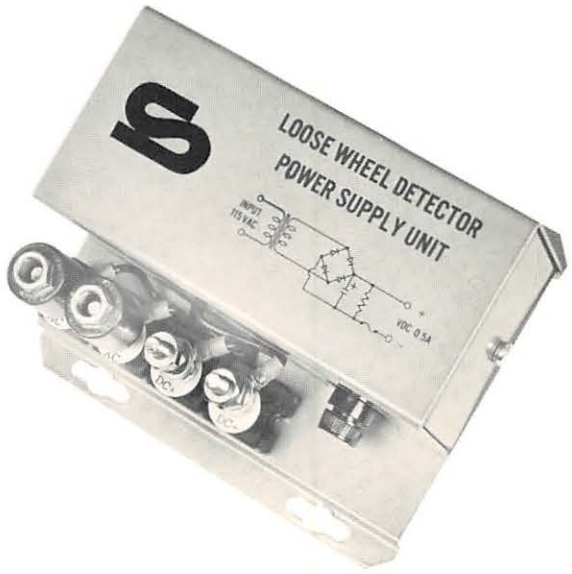
Description	Part Number
Receiver Unit, 100 Hz	011901-X
Receiver Unit, 91-2/3 Hz	011901-1X
Track Relay	400518
Track Repeater Relay	400000 or 400004
Signal Transformer (ST-400)	010560-X
Track Feed Reactor	011903-X
Receiver Track Transformer	010560-1X
Code Reset Unit	011901-40X

Safetran

LOOSE WHEEL DETECTOR

MODEL LWD-10

SENSOR UNIT



POWER SUPPLY

The Model LWD-10 Loose Wheel Detector is a sensing unit designed to detect loose, misaligned, or narrow gauged wheels. Two sensing units are installed, one on each rail, opposite each other. A narrow gauged or misaligned wheel is detected, in passing, by contacting one or both sensing units which are electrically connected to an indicating relay.

A 12 VDC or 24 VDC power supply is included to provide an output from 115 VAC for the indicating circuit.

The loose wheel detector may be used at existing hot bearing detector and/or dragging equipment detector installations where the circuiting and telemetering can be utilized to transmit information. The LWD-10 is designed for use on 90 to 150 pound rail with a maximum train speed of 50 MPH.

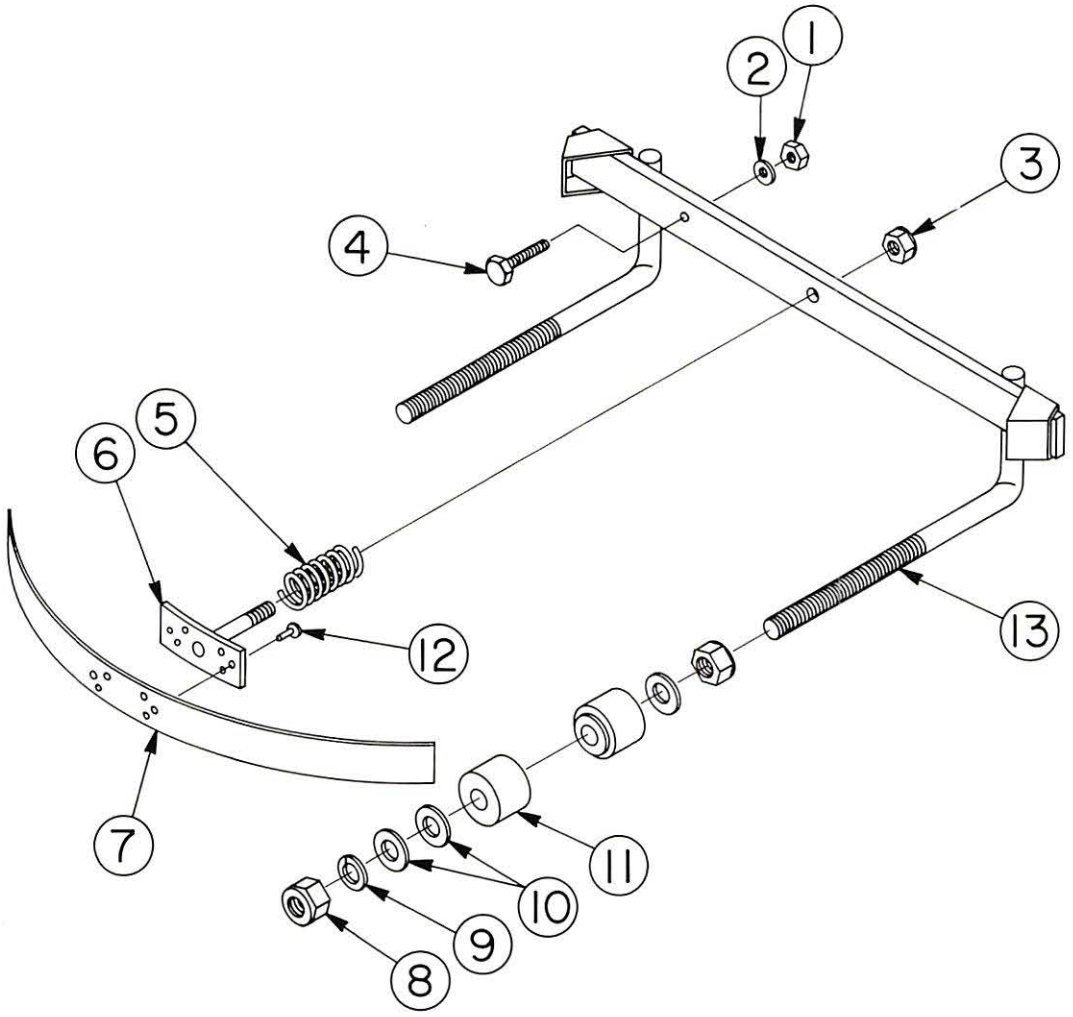
For speeds up to 15 MPH a conventional relay may be operated directly. For speeds up to 50 MPH, additional circuitry is required to assure relay pickup. Contact Safetran for application details.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Loose Wheel Detector with 12 VDC Power Supply	012200-1X
Loose Wheel Detector with 24 VDC Power Supply	012200-X
12 VDC Power Supply	012201-1X
24 VDC Power Supply	012201-X
Sensor Unit	012217-X

LOOSE WHEEL DETECTOR REPLACEMENT PARTS

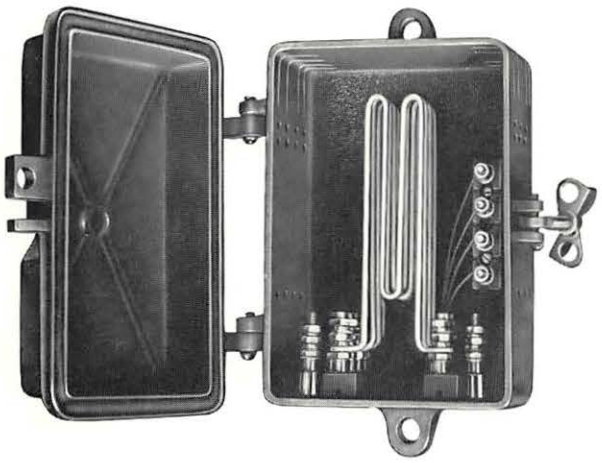


To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Nut, Stop, 5/16"-18"	1	2381-B
2	Washer, Flat, 5/16"	1	1722-C
3	Nut, Stop, 1/2"-13	1	2379
4	Cap Screw, Hex Head, 5/16"-18 x 1.5"	1	4048-Z
5	Spring	1	012220
6	Post, Tension	1	012227-X
7	Strip, Spring	1	012226
8	Nut, Stop, 5/8"-11	4	2358
9	Washer, Spring Lock, 5/8"	2	1814-SC
10	Washer, Flat, 5/8"	6	1734-SC
11	Bushing	4	012221
12	Rivet, 3/16" x .375"	6	3563-FE
13	Crossbar and Bracket Assembly	1	012219-X

Safetran

HIGH WATER DETECTOR



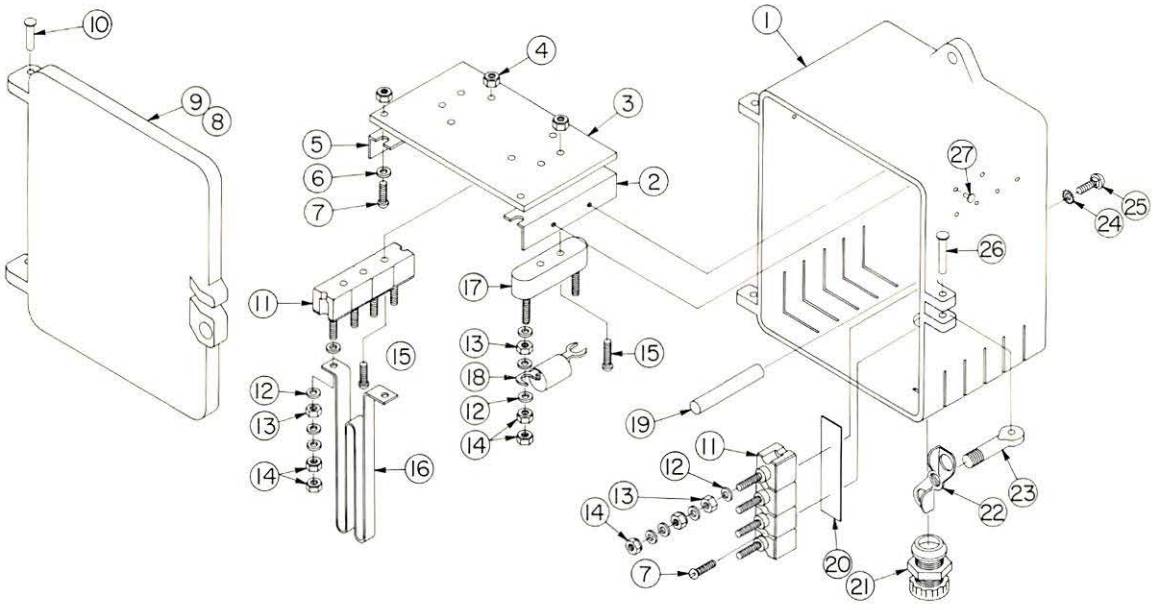
- SIMPLE AND INEXPENSIVE
- NO ELECTRONICS, OPERATES RELAY DIRECTLY
- RUGGED CAST IRON CASE
- COPPER CLAD DETECTION GRIDS

The High Water Detector is a simple and inexpensive device for detecting the presence of flood waters near the track. The presence of water between a set of grids reduces the resistance between them. The detection grids are composed of copper clad, steel loops, and sealed resistors housed in a cast iron box with hinged cover and winged nut hasp lock. The box is slotted and drilled for appropriate entry of high water and for drainage of same on recession of flood water. The box also includes terminals for connections to energy source and repeating relay, as well as an appropriate cable outlet. The high water detector requires a 500 to 1000 ohm neutral DC relay. The box measures approximately twelve inches high, nine inches wide, and seven inches deep. It may be lagged or bolted to a post, wall or foundation.

ORDERING INFORMATION

To Order: Specify High Water Detector and Part Number 012514-1X

HIGH WATER DETECTOR ASSEMBLY REPLACEMENT PARTS

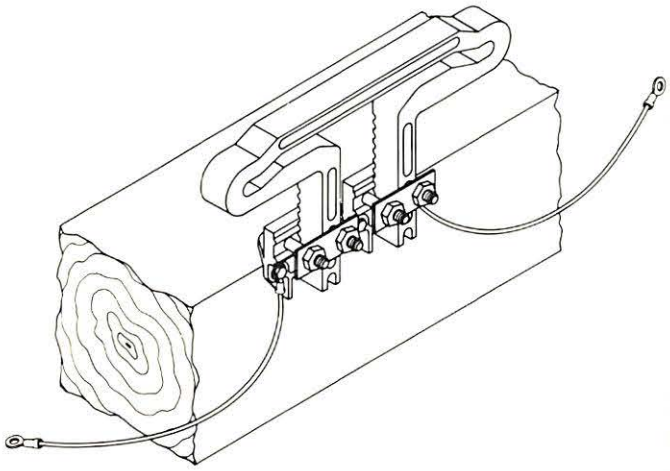


To Order: Specify Description and Part Number.

Item No.	Description	Quantity Required	Part Number
1	Body, Box	1	092511-6
2	Angle, Right	1	012514-17
3	Panel, Bakelite	1	012514-14
4	Nut, Stop	10	2360-SZ
5	Angle, Left	1	012514-15
6	Washer, Flat, 1/4"	2	1717-SC
7	Machine Screw, Fillister Head, 1/4" - 20 x .75"	4	2660-LB
8	Cover	1	092511-7
9	Gasket, Neoprene	1	104501
10	Rivet, Round Head, 1/4" x 1"	2	3646-RC
11	Block, Terminal	12	023390-14X
12	Washer, Beveled	54	023834
13	Nut, Clamp	14	023832
14	Nut, Binding	28	023831
15	Machine Screw, Fillister Head, 1/4" - 20 x 1"	8	2662-LB
16	Electrode	4	012514-16
17	Block, Terminal	1	023612-11X
18	Resistor, Sealed	1	029245-4X
19	Rod, Nylon	1	012514-20
20	Pad, Filler	1	023390-25
21	Connector, Box	1	012514-18
22	Nut, Wing	1	094254-6
23	Bolt, Eye	1	094254-5
24	Washer, Lock, External Tooth, 1/4"	1	1858-ESC
25	Bolt, Carriage, 1/4" - 20 x .75"	1	5976-CW
26	Rivet, Round Head, 1/4" x 1.5"	1	3650-RSN
27	Rivet, Flat Head, 3/16" x .625"	4	3923-FC

Safetran

DRAGGING EQUIPMENT DETECTOR



Safetran Dragging Equipment Detector is especially suited for use at approaching interlockings, tunnels, bridges, or other locations to detect any defective equipment that might possibly be hanging beneath cars or locomotives and might cause damage or derailment. Installed at car inspection pits in classification yards, it can be used to warn inspectors of such defects on approaching cars. Operation is simple. Detector arms are broken by dragging equipment, opening electrical circuit.

The detector assembly consists of galvanized gray cast iron detector arms, galvanized steel supports, insulated Bond Strand connectors, a bootleg for circuit connections, and all mounting hardware for standard 9 inch tie.

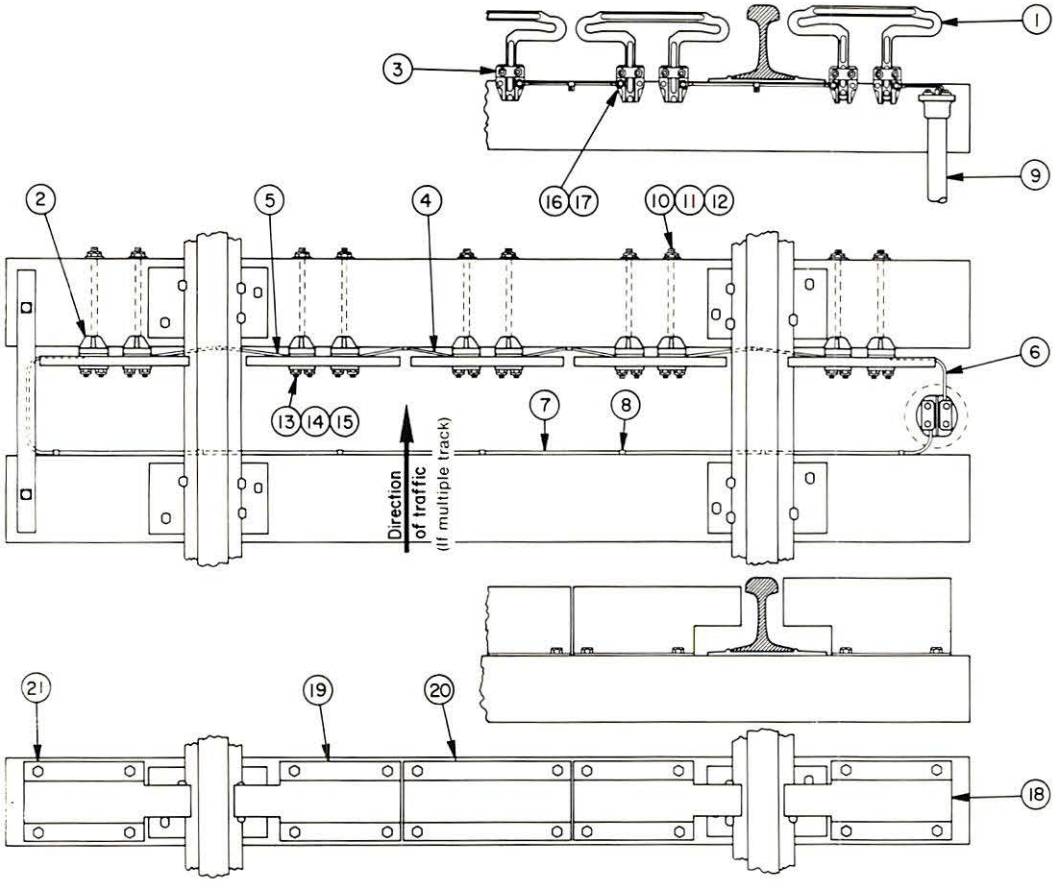
Optional ice and snow deflectors, of formed 14 gauge galvanized steel, can be furnished when requested. Mounting hardware is supplied for lagging to the top of the tie.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Dragging Equipment Detector Assembly (Items 1-17)	110454-13X
Ice and Snow Deflector Assembly (Items 18-21)	110454-10X

DRAGGING EQUIPMENT DETECTOR ASSEMBLY AND REPLACEMENT PARTS

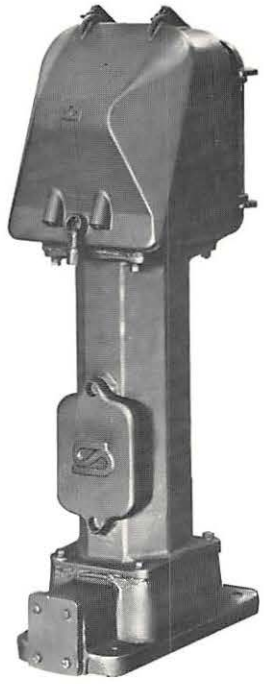


To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number
1	Arm, Detector	5	110454-8
2	Support, Detector Arm	10	110454-7
3	Cap, Support	10	110454-2
4	Connector, 12 inch	2	110454-3X
5	Connector, 18 inch	2	110454-5X
6	Connector, 14 inch	1	110454-4X
7	Connector, 10 feet	1	110454-6X
8	Clip, Connector	10	021378-23X
9	Bootleg, Model 563	1	090563-1X
10	Machine Screw, Square Head, 3/4″-10 X 11″	10	8093-SC
11	Washer, Wrought, 3/4″	10	1758-SC
12	Nut, Hex, 3/4″-10	10	2207-SC
13	Machine Screw, Square Head, 1/2″-13 X 3″	20	7997-SC
14	Washer, Spring Lock, M, 1/2″	20	1812-MSC
15	Nut, Hex, 1/2″-13	20	2108-SC
16	Machine Screw, Hex Head, 1/4″-20 X .875″	20	2661-HSC
17	Washer, Spring Lock, M, 1/4″	20	1808-MSC
18	Deflector, Outside	2	110454-10
19	Deflector, Inside	2	110454-11
20	Deflector, Center	1	110454-12
21	Lag Bolt, Square Head, 1/4″ X 3″	20	5102-14

Safetran

ELECTRIC SWITCH LOCK



- AVAILABLE IN BOTH DWARF AND PEDESTAL CONFIGURATIONS
- OPERATION AND DESIGN IS SIMPLE AND RELIABLE
- PICK-PROOF EMERGENCY RELEASE

Safetran's Electric Switch Lock is a DC-operated, forced-dropped switch lock designed to provide protection of hand-throw switches or any other device which is locked by a rod and has provision for electric lock release.

The electric lock is available in both the dwarf and pedestal configurations. Operation and design of the electric switch lock is simple and reliable. An internal electromechanical relay lifts a locking key from a notch in a locking dog. This allows the locking plunger to be raised by a manual rotation (180 degrees) of the operation handle. Once the electric lock has been released and the switch moved from its normal position, the electric lock cannot be locked again until the switch has been returned to its normal position. A semi-circular lug in the trainman's door prevents the electric lock from being shut unless the operating handle is in the locked position.

A door-operated circuit controller can be built into the switch lock to provide two normally closed contacts.

An optional pick-proof emergency lock release permits the switch to be unlocked and operated for emergency reasons.

Both the pedestal and the dwarf switch lock have a junction box built in with two terminal blocks with twelve terminals to a block.

The lock is constructed of a sturdy cast iron with an integral partition separating the mechanism from the wire compartment. The lock is weather-proofed with a neoprene seal around both the maintainer's door cover and the trainman's door.

Both versions of the electric switch lock meet or exceed all applicable AAR specifications.

ORDERING INFORMATION

A complete switch lock installation including the electric switch lock, lock bar, switch circuit controller, controller rod, swivel front rod, stud assembly, and all associated hardware is available through Safetran. See references below for ordering information. See L-Guide for typical layout.

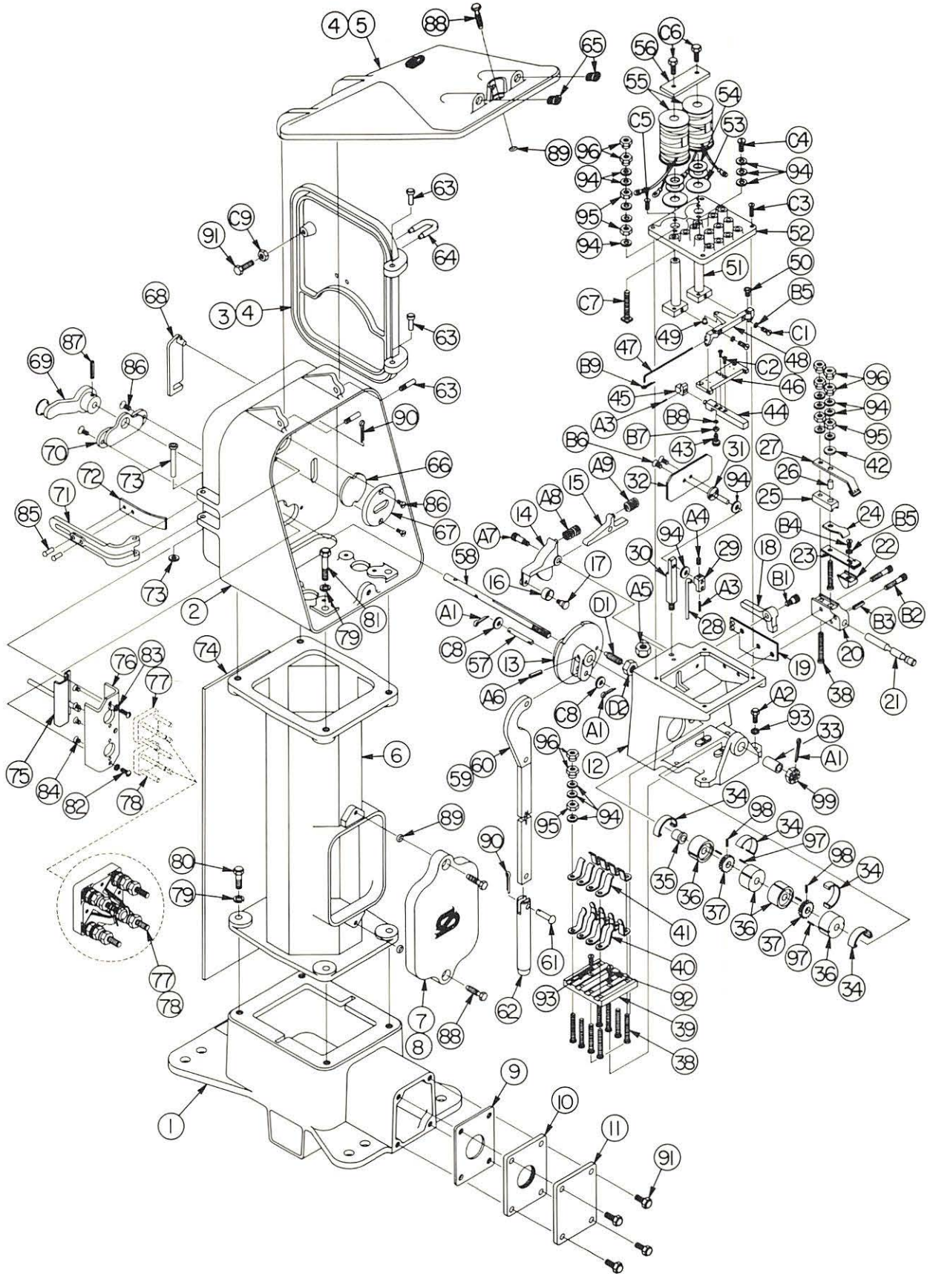
Description	Ordering Reference
Electric Switch Lock, Dwarf (Low)*	120000-3X
Electric Switch Lock, Pedestal (High)*	120000-4X
Electric Switch Lock, Dwarf (Low)* with Emergency Release and Door Operated Circuit Controller	120000-1X
Electric Switch Lock, Pedestal (High)* with Emergency Release and Door Operated Circuit Controller	120000-X
Lock Bars	See Safetran Catalog Section L-2
Switch Circuit Controller	See Safetran Catalog Section D-12
Controller Rods	See Safetran Catalog Section L-4
Front Rods	See Safetran Catalog Section L-3
Point Lugs	See Safetran Catalog Section L-4
Switch Point Roller**	See Safetran Catalog Section L-5
Pedestal-mounted Terminal Boxes	See Safetran Catalog Section K-6
Tie Straps	Call Factory with Your Specifications
Tie Bolts	Call Factory with Your Specifications

*Specify desired resistance (16, 200, 300, 400 or 500 Ohms) of electric release mechanism.
**Recommended for switch points 29 feet and longer.

OPERATING VALUES

Resistance	Pick-up and Working Current	Drop-Away Current	Normal Operating Voltage
16	0.091	0.009	2V
200	0.030	0.003	8V
300	0.027	0.003	10V
400	0.024	0.002	12V
500	0.019	0.002	12V

ELECTRIC SWITCH LOCK ASSEMBLY



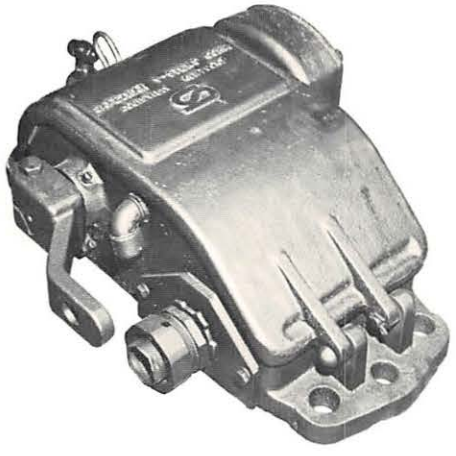
ELECTRIC SWITCH LOCK ASSEMBLY AND REPLACEMENT PARTS
PART NUMBERS 120000-X AND 120000-1X

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base	1	120004-1	63	Pin, Hinge	4	042358-1
2	Box	1	120000-1	64	Staple, Terminal Box	1	151517
3	Door	1	120001-1	65	Bushing, Vent	2	041913-X
4	Gasket	2	120058	66	Glass, Sight	1	120054-2
5	Cover, Unilens	1	042281-3	67	Frame, Sight Glass	1	120054-1
6	Pedestal	1	120002-1	68	Lever, Release	1	120052-1
7	Door, Terminal Box	1	100003-1	69	Crank	1	120013-1
8	Gasket	1	120056	70	Support, Crank	1	120053-1
9	Gasket	1	120055	71	Hasp	1	151515-4
10	Plate, Cover	1	120049-1	72	Spring, Door Hasp	1	151516
11	Plate, Cover	1	120049	73	Pin, Hasp	1	151537-5X
12	Frame, Relay	1	120010-1	74	Partition	1	120057
13	Cam	1	120011-1	75	Stem Assembly	1	120031-1X
14	Follower, Cam	1	120012-1	76	Body, Push Button Stand	1	120030-1
15	Lever, Release	1	120014-1	77	Button, Push Assembly	1	025100-12X
16	Roller	1	120016	78	Button, Push Assembly	1	025100-13X
17	Retainer, Lever	1	120022	79	Washer, Spring Lock, M, 1/2"	8	1812-MSC
18	Arm, Release	1	120044-1	80	Cap Screw, Hex Head, 1/2"-13 x 1.25"	4	4167-HSC
19	Retainer, Spring Assembly	1	120034-X	81	Cap Screw, Hex Head, 1/2"-13 x 2.75"	4	4173-HSC
20	Block, Release	1	120021	82	Machine Screw, Round Head, #10-24 x .75"	2	2595-RSC
21	Activator, Contact	1	120023	83	Washer, Spring Lock, M, #10	2	1806-MSC
22	Block, Follower	1	120015	84	Machine Screw, Flat Head, #8-32 x .5"	4	2574-FB
23	Contact Assembly	1	120032-X	85	Rivet		
24	Support	1	120047	86	Machine Screw, Flat Head, #10-24 x .5"	4	2592-FSC
25	Retainer, Contact	1	120029	87	Pin, Cotter, 3/16" x 1.75"	1	1036-SC
26	Bushing, Insulating	1	041414	88	Bolt, Locking	3	042056
27	Contact Assembly	1	120046-X	89	O-Ring	3	042380
28	Trunnion	1	040723-2	90	Pin, Cotter, 1/8" x 1"	2	1017-SC
29	Block, Flag Pivot	1	120039	91	Cap Screw, Hex Head, 3/8"-16 x 1"	5	4088-HSC
30	Stand, Sign	1	120019	92	Machine Screw, Round Head, 1/4"-20 x .75"	2	2660-RSC
31	Pivot, Sign	1	120017	93	Washer, Spring Lock, M, 1/4"	6	1808-MSC
32	Sign Assembly	1	120024-X	94	Washer, Beveled	45	023834
33	Bushing	1	120033	95	Nut, Binding	14	023831
34	Contact, Roller	4	120045	96	Nut, Clamp	24	023832
35	Spacer	1	120043	97	Pin, Roll, 1/16" x 1/2"	4	1505-SC
36	Roller, Contact	4	120018	98	Pin, Roll, 1/8" x 3/8"	2	1548-SC
37	Gear, Drum Switch	2	120025	99	Nut, Shoulder Hex, 1/2"-13	1	2494-2SC
38	Bolt, Terminal	10	010427-6	A1	Pin, Cotter, 5/32" x 1"	3	1025-SC
39	Board, Terminal	1	120020	A2	Cap Screw, Hex Head, 1/4"-20 x 1"	4	4004-HSC
40	Finger, Contact	8	025111	A3	Pin, Roll, 1/16" x 1/2"	2	1505-E
41	Backer, Contact Finger	8	025111-1	A4	Set Screw, Socket Head, #10-32 x .1875"	1	4589-SC
42	Washer, Insulating	1	070627	A5	Nut, Esna, 3/8"-16	1	2387-SC
43	Screw, Top	1	040318	A6	Pin, Roll, 3/16" x 1.5"	1	1599-SC
44	Arm, Release	1	120028	A7	Bolt, Shoulder	1	120026
45	Block, Release	1	120027	A8	Spring, Cam Return	1	120041
46	Armature	1	040315-12AX	A9	Spring, Arm Return	1	120042
47	Trunnion	1	040723-1	B1	Bolt, Shoulder	1	120036
48	Bracket, Armature	1	040319	B2	Machine Screw, Round Head, 1/4"-20 x 1.5"	2	2665-RSC
49	Pin, Stop	1	040335	B3	Pin, Roll, 1/4" x 1"	1	1632-SC
50	Sleeve, Adjusting	2	040320	B4	Machine Screw, Round Head, #8-32 x .25"	1	2570-RE
51	Core	2	040314-5	B5	Washer, Spring Lock, M, #8	3	1805-MZ
52	Plate, Four Point Assembly	1	040310-AX	B6	Machine Screw, Flat Head, #8-32 x .375"	2	2572-FB
53	Washer, Insulating	2	040371	B7	Nut, Machine, #10-32	1	2015-BN
54	Washer, Cork	4	040524-A	B8	Washer, Spring Lock, M, #10	1	1806-MZ
55	Coil, Relay	2		B9	Pin, Cotter, 1/16" x .5"	1	1000-BN
	8 Ohm		040372-26X	C1	Machine Screw, Round Head, #8-32 x .625"	2	2576-RBN
	100 Ohm		040372-27X	C2	Machine Screw, Flat Head, #8-32 x .75"	2	2577-FSC
	150 Ohm		040372-28X	C3	Machine Screw, Round Head, #10-32 x .75"	4	2619-RBN
	200 Ohm		040372-10X	C4	Machine Screw, Round Head, #14-24 x .5"	1	2838
	250 Ohm		040372-12X	C5	Machine Screw, Flat Head, #10-32 x 1"	1	2621-FBN
56	Yoke	1	040313-A	C6	Machine Bolt, Hex Head, G5, 5/16" x .75"	2	110207-500HAN
57	Pin, Pivot	1	120050-2	C7	Post, Binding	2	023833
58	Shaft, Drum	1	120037	C8	Washer, Flat, 3/8"	2	1726-SC
59	Pivot, Operating Rod	1	120051	C9	Nut, Hex, 3/8"-16	1	2104-SC
60	Bar, Weldment	1	120051-X	D1	Plunger, Plate Spring	1	026003-4
61	Rivet	1	120050-1	D2	Nut, Hex Jam, 1/2"-13	1	2158-SC
62	Rod, Dwarf	1	120050				

Safetran

SWITCH CIRCUIT CONTROLLER

MODEL SSC-402



- **RUGGED CAST IRON, WEATHERPROOF HOUSING**
- **FOUR PERMANENTLY ALIGNED NORMAL AND REVERSE CONTACTS**
- **INDIVIDUALLY ADJUSTABLE CAMS FOR SIMULTANEOUS OR PROGRESSIVE OPERATION**
- **VENTILATED HOUSING MINIMIZES CONDENSATION**

Safetran's Model SSC-402 Switch Circuit Controller provides for a reliable "circuit-open" or "circuit-closed" position indication of any two position device. Mechanical linkage to the crankarm of the controller actuates its four normal/reverse contacts.

The arched cast iron case, with reinforcing bridges inside the cover, provides great strength and eliminates projecting corners. With cover tightly closed, the case becomes a weatherproof housing well ventilated to minimize condensation. The terminal compartment is sealed from mecnanism compartment; preventing grease and oil from collecting on wires and terminals.

The switch circuit controller's 1-1/2 inch diameter camshaft provides strength and rigidity for dependable controller operation and long life. 1-1/8 inches square at each end, the shaft provides for mounting of the crankarm for either right- or left-hand operation as desired.

Its four cast steel cams can be separately adjusted at any desired position of the activating device. The roller cam followers actuate the contacts; providing positive contact pressure.

Commonly used to detect switch positions, the Model SSC-402 can also detect the positions of derails, bridge locks, slide detectors, and tunnel doors. It is capable of shunting track circuits as well as controlling relay circuits.

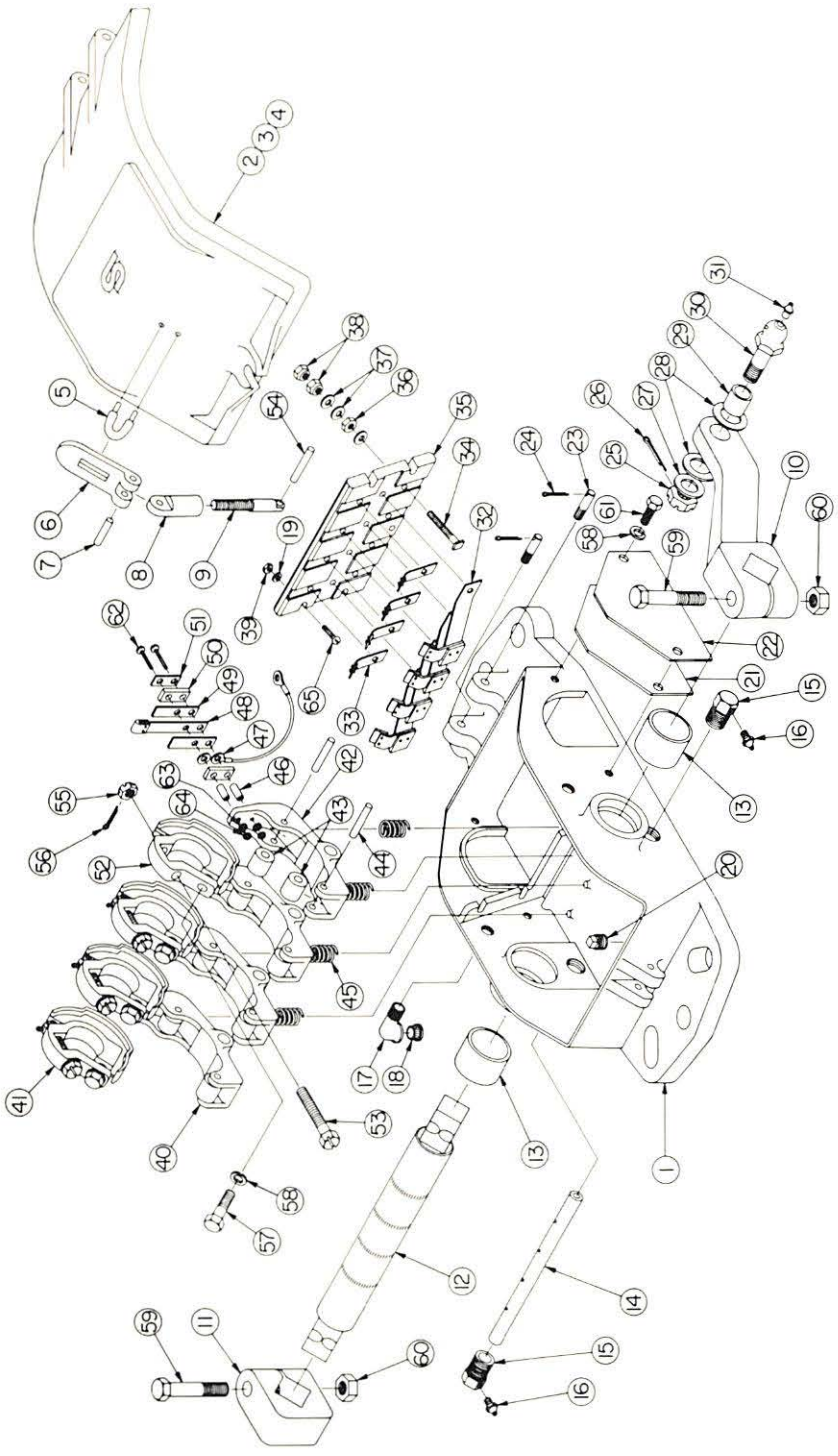
The Model SSC-402 is compact, has a low clearance profile, and is easily mounted on a single tie.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Model SSC-402 Switch Circuit Controller with 4-1/2" Crank Arm	110800-3X
Model SSC-402 Switch Circuit Controller with 5-3/8" Crank Arm	110800-4X

SWITCH CIRCUIT CONTROLLER ASSEMBLY

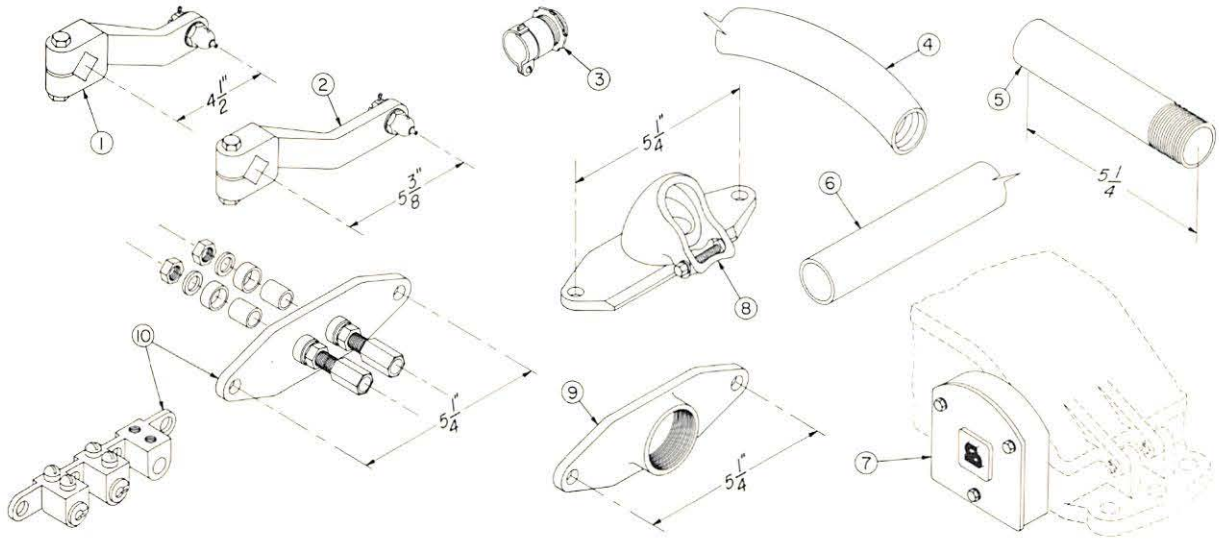


SWITCH CIRCUIT CONTROLLER REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Cabinet, Switch Circuit Controller	1	110800	33	Contact	4	110818-X
2	Cover, Switch Circuit Controller	1	110801	34	Post, Terminal	12	010427-5A
3	Gasket, 3/4" x 1/2" x 14"	1	104517	35	Board, Terminal	1	110812
4	Gasket, 1/2" x 1/2" x 27"	1	104512	36	Nut, Clamp	12	023832
5	Hasp	1	110823	37	Washer, Beveled	36	023834
6	Latch	1	110824-1	38	Nut, Binding	24	023831
7	Rivet, Round Head, 1/4" x 1.375"	1	3649-RSC	39	Nut, Hex, #10-24	5	2013-SC
8	Spool, Threaded	1	110824	40	Cam Follower Complete	4	110802-X
9	Bolt, Locking	1	110815-1	41	Full Throw Cam Assembly	4	110819-1X
10	Crank, 4-1/2"	1	110820-2	42	Follower, Cam	4	110802
	Crank, 5-3/8"	1	110820-1	43	Roller	8	110805
11	Cap	1	110821	44	Shaft, Roller	8	110806
12	Shaft, Crank	1	110804	45	Spring	4	110826
13	Bushing, Main Shaft	2	110816	46	Washer, Insulating	8	110809
14	Shaft, Cam	1	110811	47	Lead	4	110808-X
15	Retainer, Cam Shaft	2	110817	48	Spring, Contact	4	110810-X
16	Fitting, Grease	2	083510	49	Support	8	110810-1
17	Elbow, 90°	2	5626-SG	50	Block, Insulating	8	070774
18	Bushing, Vent	2	041913-X	51	Plate, Washer	4	070778
19	Washer, Flat, #10	5	1710-B	52	Cam	4	110219-9
20	Plug, 1/4"	1	5330-SG	53	Stud, Adjuster	4	110827
21	Gasket, Cover Plate	2	110825-1	54	Shaft, Locking Bolt	1	110815-2
22	Plate, Cover	2	110825	55	Nut, Slotted Hex, 3/8"-10	4	110827-2
23	Pin, Hinge	2	110822	56	Pin, Cotter, 1/16" x .5"	4	1000-SC
24	Pin, Cotter, 5/32" x .75"	2	1024-SC	57	Cap Screw, Hex Head, 5/16"-18 x 1.5"	4	4048-HSC
25	Nut, Slotted Hex, 5/8"-11	1	2378-SC	58	Washer, Spring Lock, M, 3/8"	8	1810-SC
26	Pin, Cotter, 1/8" x 1.25"	1	1018-SC	59	Cap Screw, Hex Head, 1/2"-13 x 3"	2	4174-HSC
27	Washer, Wrought, 5/8"	1	1757-C	60	Nut, Hex, 1/2"-13	2	2108-SC
28	Washer, Insulation	2	110556-68	61	Cap Screw, Hex Head, 5/16"-18 x .375"	4	4043-HSC
29	Bushing, Insulation	1	110556-6B	62	Machine Screw, Round Head, #10-32 x 1"	8	2621-RBN
30	Stud, Ball	1	110556-6A	63	Washer, Spring Lock, M, #10	8	1806-MSC
31	Fitting, Grease	1	110333-8	64	Nut, Hex, #10-32	8	2015-BN
32	Contact, Operating	4	110813-1X	65	Machine Screw, Round Head, #10-24 x 1"	5	2597-RSC

SWITCH CIRCUIT CONTROLLER



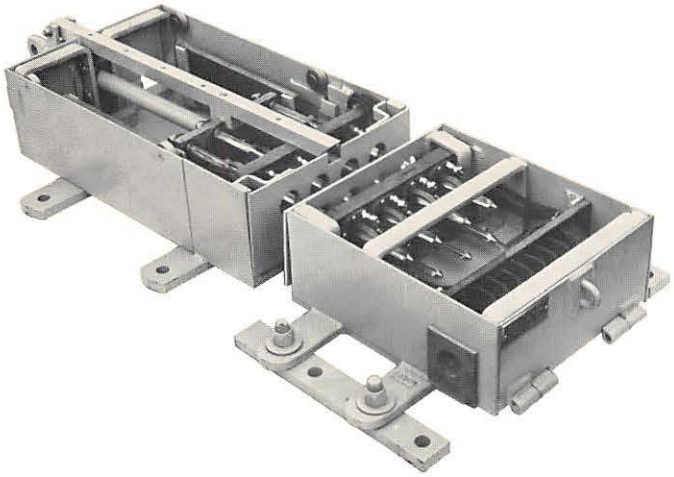
To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Crank, 4-1/2"	110820-1X
2	Crank, 5-3/8"	110820-X
3	Coupling, Flexible Conduit	110833-2
4	Conduit, Flexible, 1-1/2" (Specify length in inches)	110825-4
5	Nipple, Pipe, 1-1/2"	110833-3
6	Conduit, 1-7/8" (Specify length in inches)	110825-5
7	Cam, Self-Centering	110832-X
8	Coupling, 45°	110833-1X
9	Cap, Wire Outlet	110833
10	Cap, Terminal	110831-X

Note: All accessories listed above are compatible with switch circuit controllers manufactured by Wabco and GRS.

Safetran

BRIDGE CIRCUIT CONTROLLERS



- RUGGED, COMPACT UNITS
- WITHSTAND HEAVY VIBRATION
- 4-WAY TO 64-WAY MODULE CONSTRUCTION

Safetran's Bridge Circuit Controllers are rugged, compact units that require low power and take the vibration of heavy traffic movements in their stride.

The Bridge Circuit Controller is a complete range of capacities from 4-way to 64-way and for voltage and current as required.

ORDERING INFORMATION

To order: Specify number of circuits, voltage, current and part number 033000

Section E

Safetran

HOUSINGS

SECTION E

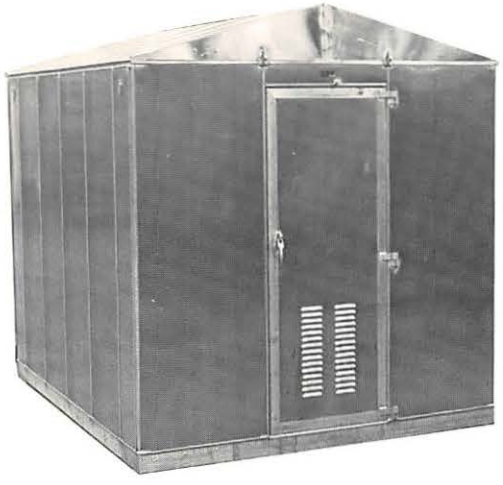
CONTENTS

Product	Subsection
Instrument Houses	1
Instrument Shelters	2
Instrument Cases	3
Instrument Cases - Top Loading	4
Instrument Cases - Wall, Wood Pole, or Pipe Mast Mounted	5
Telephone Booth and Boxes	6
Apparatus and Cable Termination Boxes - Pipe, Pole, Wall, or Crossarm Mounted	7
Battery Wells	8
Cable Posts	9

Safetran

INSTRUMENT HOUSES

ALUMINUM, STEEL, AND COR-TEN® STEEL



Aluminum House

Steel House

GENERAL DESCRIPTION

Safetran Instrument Houses can be furnished in several sizes with a variety of door arrangements. Construction can be of aluminum, steel, or Cor-Ten® steel. Doors on these houses, provided with hooks and clips to hold the door(s) at a 90 degree position, are completely removable when open. Door handles are designed to accept padlock or can be locked by means of an optional built-in locking screw using a standard terminal wrench.

The walls are formed panels in two-foot sections with all seams sealed. Inside walls have vertical angles with punched keyslot holes for the mounting of shelf brackets, mounting boards, and wire chases with tag boards. Each house is equipped with switch and duplex outlet located at the entrance door. An overhead light receptacle with pull chain and convenience outlet is provided. Wiring is not provided unless specified.

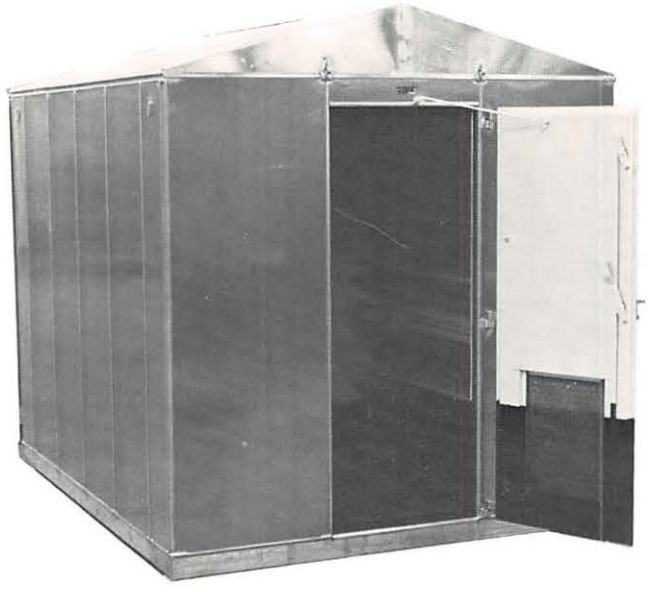
Holes are located in the floor (4-5/8 inch diameter) with two bottom bushings provided to allow wire entry into the house. An aerial cable inlet and eyebolt, can be mounted on two of the four corners of the house.

Aluminum instrument houses are constructed of .100 inch aluminum sheeting. Steel and Cor-Ten® steel houses are constructed of 12 and 14 gauge steel respectively.

Steel houses are painted with primer and finished with aluminum paint on the exterior, and gray paint on the interior. Cor-Ten® steel houses are finished the same as steel on the interior, but are unfinished on the exterior. The outermost surface of Cor-Ten® steel oxidizes, providing a natural protective finish for the exterior of the house.

The interior can be lined with single (1/2 inch), double (1 inch), or high efficiency Thermax® (2 inch) insulation. (See catalog section E-1-12 for details.)

ALUMINUM INSTRUMENT HOUSE



Aluminum Instrument houses are constructed of .100 inch aluminum sheeting. Floors are formed from 6 inch wide aluminum extrusions which interlock together and are welded to the base frame. Wall panels are two-foot sections joined by vertical extrusions. All seams are sealed. Three holes are located in the floor (4-5/8 inch diameter) with two bottom bushings provided to allow wire entry into the house.

Aluminum houses are furnished with ventilators in each door of the house. Filters for these ventilators are provided.

Lifting rings, located at each end of the house, allow for it to be lifted onto foundation.

Aluminum houses are unfinished on the exterior, and are painted gray on the interior.

The interior can be lined with single (1/2 inch), double (1 inch), or high efficiency Thermax® (2 inch) insulation. (See catalog section E-1-12 for details.)

HOUSE SIZES AND BOLT SPACINGS

House Size In Feet	Bolt Spacing In Inches	House Size In Feet	Bolt Spacing In Inches	House Size In Feet	Bolt Spacing In Inches
5 x 5	52 x 52	6 x 12	64 x 136	6 x 20	64 x 232
6 x 6	64 x 64	6 x 14	64 x 160	8 x 10	88 x 112
6 x 8	64 x 88	6 x 16	64 x 184	8 x 12	88 x 136
6 x 10	64 x 112	6 x 18	64 x 208		

STEEL AND COR-TEN® STEEL INSTRUMENT HOUSES

Steel and Cor-Ten Steel Instrument houses are constructed of 14 gauge steel with the exception of the floor and door(s); they are of 12 gauge steel. The floor is fabricated from steel, formed into 8 inch interlocking channels. Walls are formed panels in two-foot sections with all seams sealed, covered, and caulked. The floor has three 4-5/8 inch diameter knockouts. Two bushings for these knockouts are provided to allow wire entry into the house.

These houses are furnished with ventilator(s) located in the roof. They are equipped with an adjustable damper.

Removal of ventilator(s) allow for chain to be fastened to the hoisting pipe under the roof sheeting to allow lifting of house onto foundation.

Steel houses are painted with primer and finished with aluminum paint on the exterior, and gray paint on the interior. Cor-Ten® steel houses are finished the same as steel on the interior, but are unfinished on the exterior. The outermost surface of Cor-Ten® steel oxidizes, providing a natural protective finish for the exterior of the house.

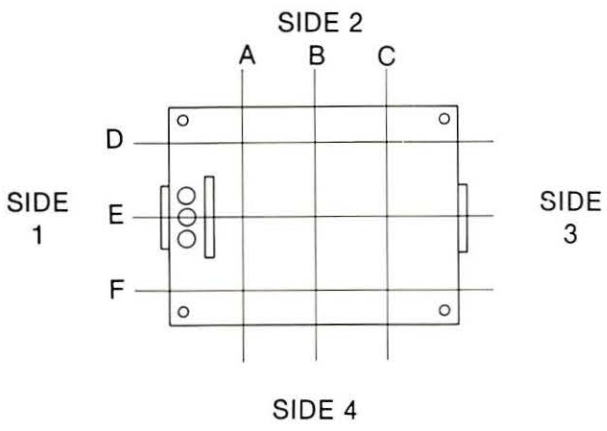
The interior can be lined with single (1/2 inch), double (1 inch), or high efficiency Thermax® (2 inch) insulation. (See catalog section E-1-12 for details.)

HOUSE SIZES AND BOLT SPACINGS

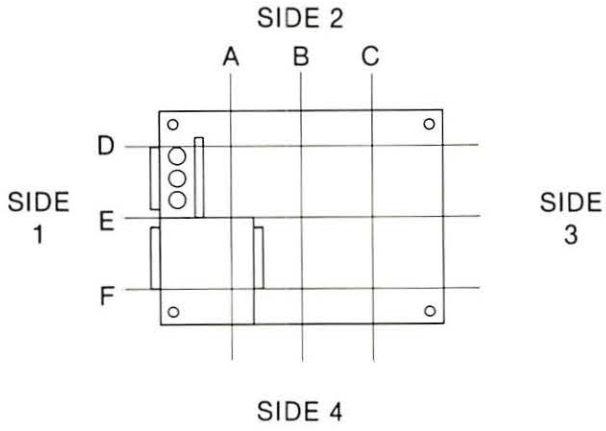
House Size In Feet	Bolt Spacing In Inches	House Size In Feet	Bolt Spacing In Inches	House Size In Feet	Bolt Spacing In Inches
5 x 5	52 x 52	6 x 18	64 x 208	8 x 20	88 x 232
6 x 6	64 x 64	6 x 20	64 x 232	9 x 10	100 x 112
6 x 8	64 x 88	8 x 10	88 x 112	9 x 12	100 x 136
6 x 10	64 x 112	8 x 12	88 x 136	9 x 14	100 x 160
6 x 12	64 x 136	8 x 14	88 x 160	9 x 16	100 x 184
6 x 14	64 x 160	8 x 16	88 x 164	9 x 18	100 x 208
6 x 16	64 x 184	8 x 18	88 x 208	9 x 20	100 x 232

ORDERING INFORMATION

STYLE 1



STYLE 2



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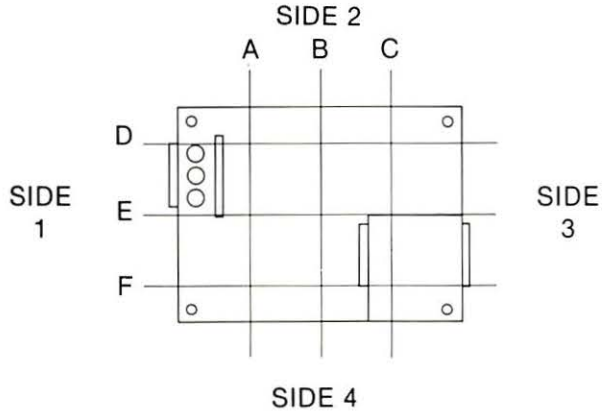

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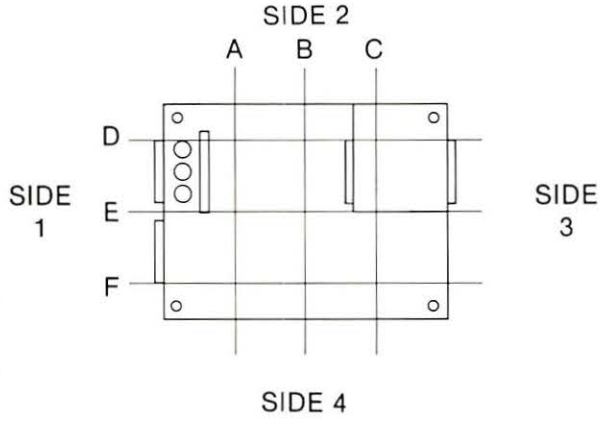
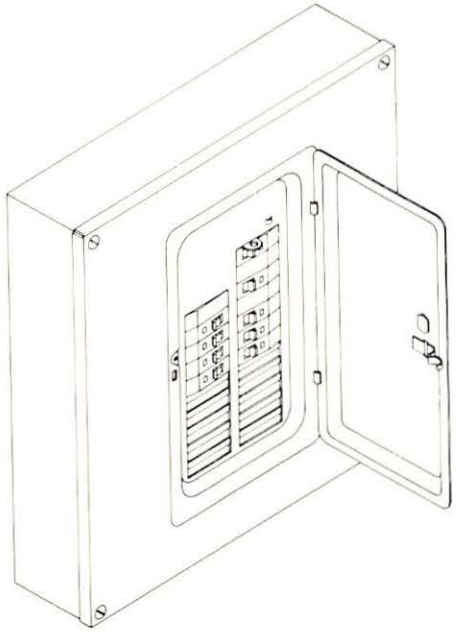
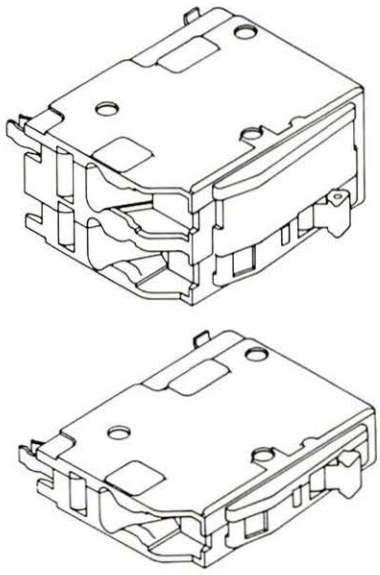


To Order, Specify the following:

1. Either Aluminum, Steel, or Cor-Ten® Steel Instrument House.
2. Style of House via above diagrams, specify telephone booth if desired.
3. Size of House (see tables on pages E-1-2 and E-1-3).
4. List accessories and locations via above diagrams.
   - Wiring Package
   - Heating System
   - Air Conditioning System
   - Ventilation System
   - Relay Racks
   - Wall Mounted Accessories
   - Insulation, either single (1/2 inch), double (1 inch), or high efficiency Thermax® (2 inch). (See catalog section E-1-12 for details.)

WIRING PACKAGES





Wiring packages for instrument houses include a 100 amp service circuit breaker box with 12 breaker capacity. Also included are 1 circuit breaker for 120 VAC equipment and 2 circuit breakers for 240 VAC equipment. Standard light fixture(s), switch, and duplex outlet will be wired at time of manufacture. Vacant circuit breaker positions will be filled with blanks. Additional circuit breakers may be ordered separately. All internal circuits are wired in conduit of appropriate size.

ORDERING INFORMATION

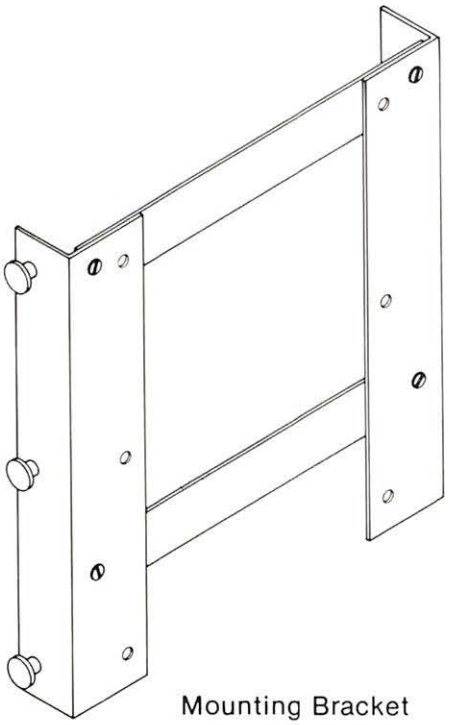
To Order: Specify Instrument House Wiring Package and Part Number 051894-34X.

CIRCUIT BREAKERS

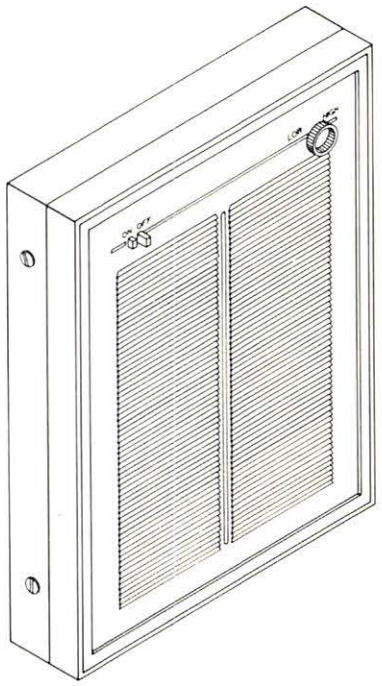
To Order: Specify Description and Part Number.

Description	Amp. Rating	Part Number	
		Single Pole	Double Pole
Circuit Breaker	15	7470-1B	7470-2B
Circuit Breaker	20	7471-1B	7471-2B

HEATING SYSTEMS



Mounting Bracket



Heating Unit

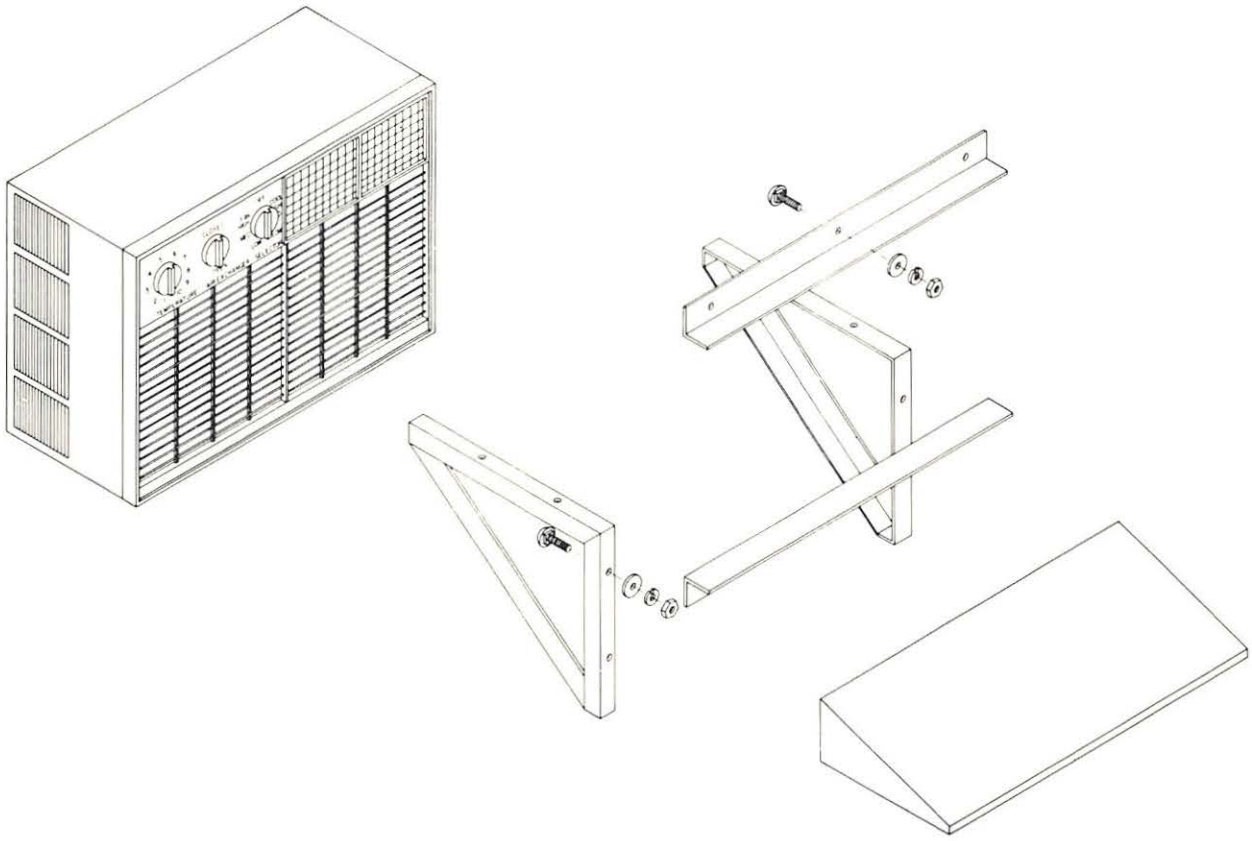
Wall Heaters feature protected and efficient cast aluminum heating grids and directional louvered cover for circulation of warm air at floor level for more even distribution. Wall Heaters may be purchased separately or with bracket to allow for mounting in Instrument Houses using the keyslot mounting angles. They may also be ordered with house to be completely installed and wired in place with circuit breaker.

ORDERING INFORMATION

To Order: Specify Watts, Voltage, and Part Number.

Watts	BTU	Voltage	Heater Only	Heater With Mt. Bracket	Heater Installed In House
1500	5,122	120	051894-31	051894-31X	051894-31XF
1500	5,122	240	051894-28	051894-28X	051894-28XF
2000	6,830	240	051894-32	051894-557X	051894-32XF
3000	10,245	240	051894-33	051894-548X	051894-33XF
4000	13,660	240	051894-13	051894-13X	051894-13XF

AIR CONDITIONING SYSTEMS



Air conditioning units for instrument houses are of high quality featuring high BTU output with minimum operating costs.

A change over thermostat is used to insure the transfer from air conditioning to heating and vice versa without conflict of systems.

The mounting bracket for the air conditioner is of heavy gauge steel, welded between vertical angles of the house.

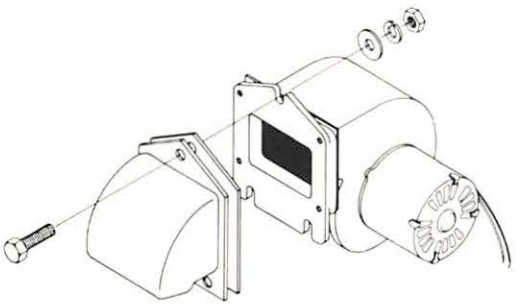
A weather hood, of steel or aluminum depending on type of house, is provided to protect the air conditioner and insure longer life of the unit.

ORDERING INFORMATION

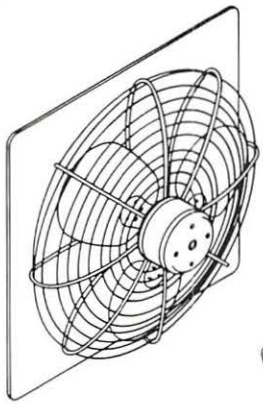
To Order: Specify BTU/H, Volts, and Part Number.

BTU/H	Volts	Amps	Watts	Part Number
5,000	115	7.5	860	051894-38X
6,000	115	7.5	860	051894-39X
8,000	115	12.0	1,375	051894-40X
10,500	115	12.0	1,375	051894-41X
13,000	230/208	9.6	1890/1820	051894-42X
15,000	230	11.5	2,400	051894-43X

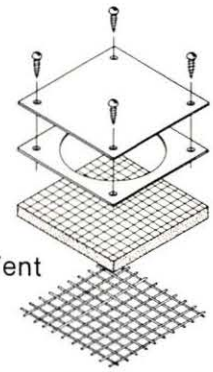
VENTILATION SYSTEMS



Centrifugal Type
Vent Fan



Propeller Type
Vent Fan



Floor Vent

Chimney Mounted
Vent Fan

The Centrifugal Type Vent Fan consists of fan, mounting adapter, exhaust outlet, gaskets, and necessary hardware to allow mounting through standard knockout in any of the four corners of the house.

The Propeller Type Vent Fan consists of exhaust fan with louvered cover and intake louver assembly. The intake louver assembly contains a filtering system and outer protective screen. Both louvers open automatically when fan is operated. The exhaust fan will be mounted on any desired wall; with intake louver assembly mounted on opposite wall, at time of manufacture.

Both fan types are supplied with thermostat to allow control between 30 and 110 degrees Fahrenheit.

The Chimney Mounted Vent Fan, for use in steel and Cor-Ten® steel houses only, mounts directly in the roof ventilator. An optional thermostat is also available to allow control between 70 and 140 degrees Fahrenheit.

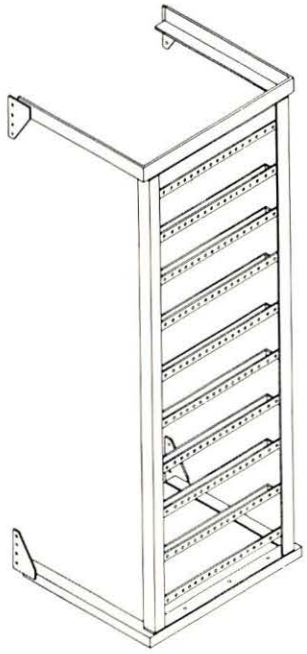
Also available are floor vents which are mounted in the floor at anchor bolt locations in the four corners of the shelter. They consist of filter material enclosed between an aluminum cover plate and a heavy screen mesh.

ORDERING INFORMATION

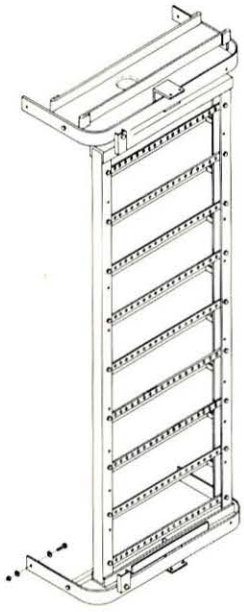
To Order: Specify Description and Part Number.

Description	Operation VAC	Exhaust CFM	Part Number
Centrifugal Type Vent Fan	110	148	035035-7X
Centrifugal Type Vent Fan	220	148	035035-503X
Propeller Type Vent Fan, 12″ Fan	115	650	051894-610X
Propeller Type Vent Fan, 16″ Fan	115	780	051894-611X
Chimney Mounted Vent Fan	120	360	051894-35AX
Floor Vents (4 required)			050624-X

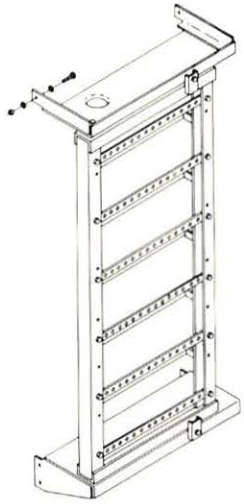
PLUG-IN RELAY RACKS



Stationary Type



Swing Type



Half Rack

Plug-In Relay Racks are mounted into the vertical angles along the sides of either steel or aluminum instrument houses. If desired, these racks may be factory installed through the center of the house.

Both the swing type and stationary type racks will accommodate Safetran ST, GRS B or US&S PN 150 plug-in relays with vertical spacing of 7-5/16 inches or 8-13/16 inches. Single size relay capacity on full size racks is 72.

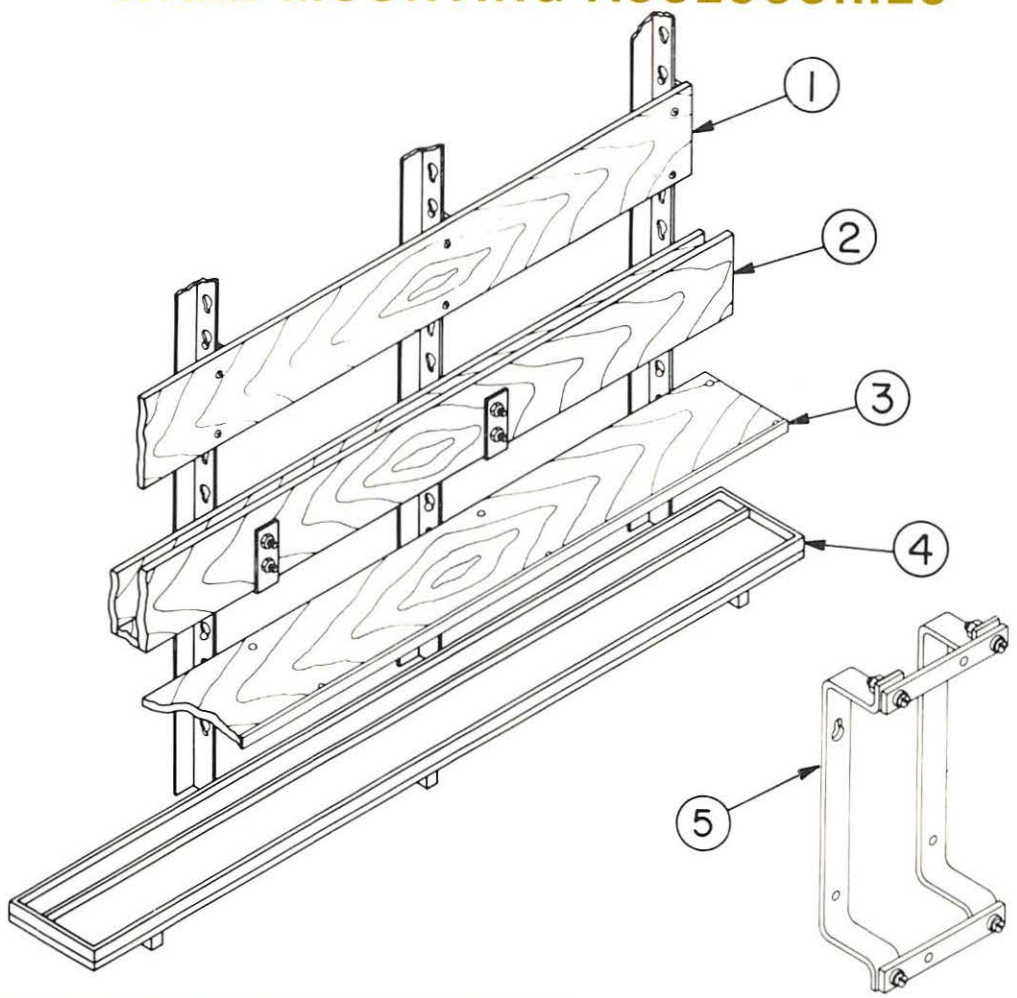
Single size relay capacity on half racks is 30. Racks will be shipped loose unless factory installation is specified.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Stationary Type Plug-in Relay Rack	051883-X
Swing Type Plug-in Relay Rack	051626-5X
Half Rack Type Plug-in Relay Rack	051626-X

WALL MOUNTING ACCESSORIES



Mounting Board Assemblies are constructed of 3/4 inch painted exterior plywood.

Wire Chase and Tag Board Assemblies are of 3/4 inch wood. The inside dimensions of wire chase are 2-1/2 inches in width and 4-3/4 inches in depth.

Shelf Assemblies are constructed of 3/4 inch painted exterior plywood. Shelves are 11-7/8 inches in width.

Battery Trays are of 3/4 inch wood and coated with an acid resistant paint. They measure 12-1/8 inches in width and 4-1/4 inches in height.

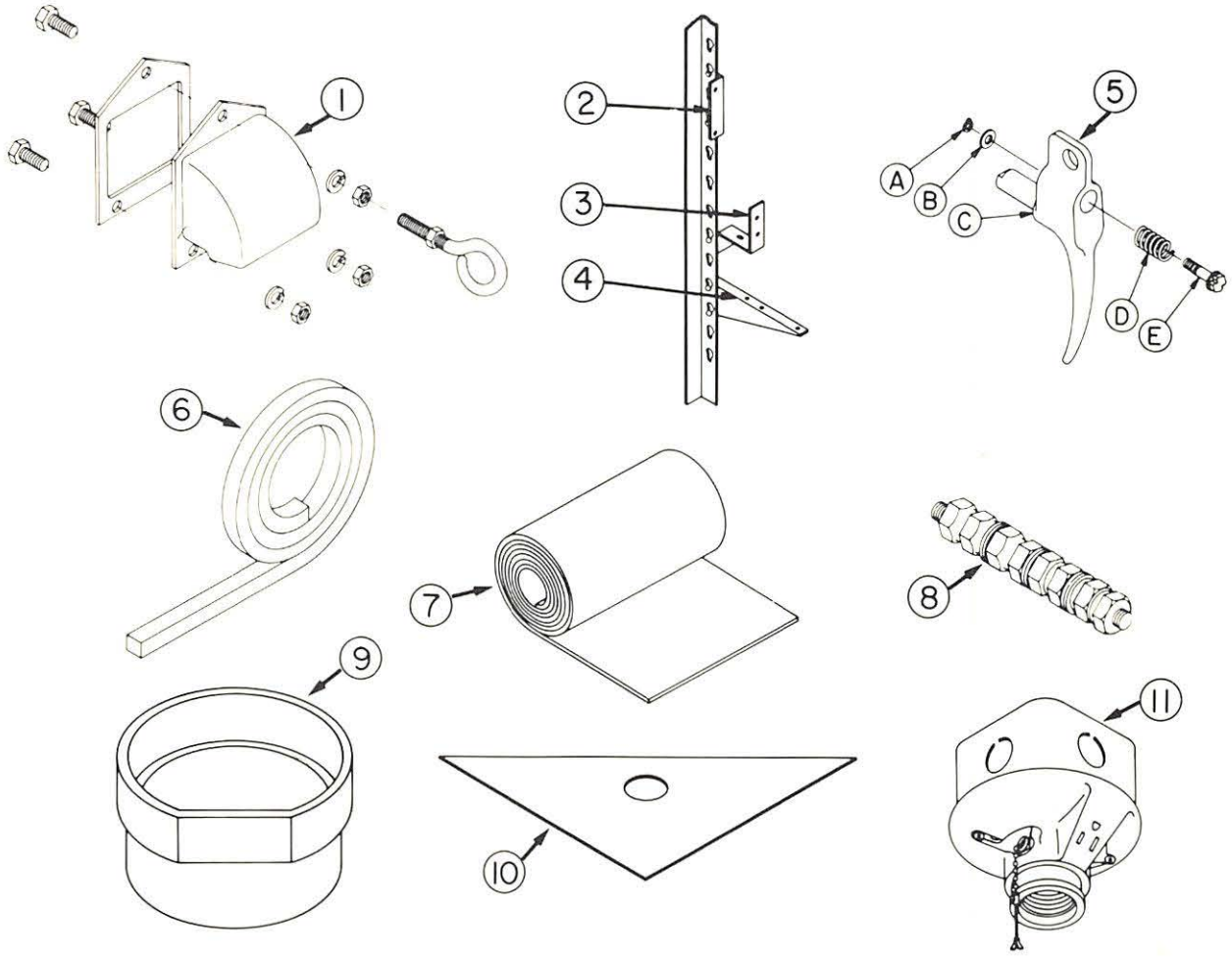
Wall mounting brackets are available for 1 to 4 plug-in relays. Hardware for mounting brackets to mounting board is included.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Mounting Board Assembly (specify height and length)	051867-513X
2	Wire Chase and Tag Board Assembly (specify length)	051843-503X
3	Shelf Assembly (specify length)	052829-500X
4	Battery Tray (specify length)	051950-555X
5	Wall Mounting Bracket for 1 Plug-in Relay	420000-51X
	Wall Mounting Bracket for 2 Plug-in Relays	420000-52X
	Wall Mounting Bracket for 4 Plug-in Relays	420000-53X

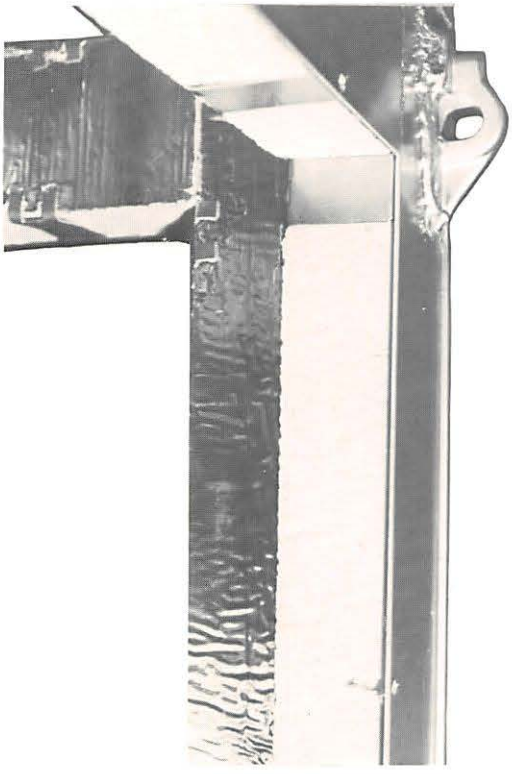
ACCESSORIES AND REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Inlet, Aerial Cable	035035-X
2	Bracket, Mounting Board (Includes Hardware)	051867-500X
3	Bracket, Shelf (Includes Hardware)	052829-3X
4	Bracket, Wire Chase and Tag Board (Includes Hardware)	051843-501X
5	Door Handle Assembly	051128-1AX
	Includes: A. Ring, Snap	7564
	B. Washer	051128-2
	C. Handle, Door	051128-5
	D. Spring	051150
	E. Bolt, Locking	051128-1X
6	Gasket, Door, .562″ x .75″ (specify length)	10-08-002
7	Mat, Rubber Floor, 36″ (specify length)	051806-504
8	Terminal, Ground	035049-X
9	Bushing, Bottom	035040
10	Pad, Base (for aluminum houses only)	052838
11	Lamp	051154-500X

THERMAX® INSULATED HOUSES



SECTION OF THERMAX® INSULATION

- **SAVES ON COOLING AND HEATING COSTS**
- **PROVIDES R-16 THERMAL BARRIER**
- **IMPROVES ELECTRONIC EQUIPMENT PERFORMANCE AND LIFE**

Thermax® insulated houses, which have the same shell as the conventional houses found in this catalog, have an R-16 thermal barrier to maintain a more uniform interior temperature. Where heating and/or cooling is used, these houses save substantially on energy costs.

The Thermax® material is constructed with a fiberglass and reinforced foam plastic core with aluminum facings. The interior facing has a white vinyl coating, whereas, the exterior surface is reflective aluminum for maximum insulation properties. These aluminum facers provide an excellent barrier to water, either liquid or vapor.

The foam core will not support combustion, and the Thermax® surfaces, being aluminum, are fire-proof.

Houses are specially designed to accommodate the insulation which forms the interior lining. Doors are of Thermax® filled double wall construction.

Filtered ventilation openings, of 25 inches by 20 inches, are provided in either door or wall for best airflow for convection cooling. These openings are provided with insulation filler for cold weather protection. Also, tear drop supports are closed-cell foam rubber filled. Floors are insulated with 1/32 inch wood fiber Celotex covered with 3/4 inch plywood and rubber mat.

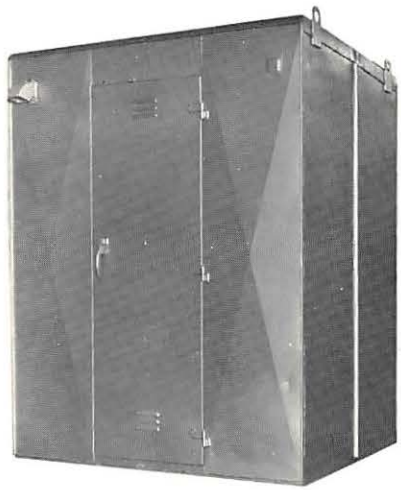
When these houses are convection cooled in summer and heated by waste heat from equipment in winter, the result is much more consistent temperature. This will often provide for improved electronic equipment performances and longer life. When winter heating and/or summer air conditioning is used, the saving in electrical energy is substantial.

To Order, Specify Thermax® Insulation When Ordering Houses from Page E-1-4.

Safetran

INSTRUMENT SHELTERS

ALUMINUM, STEEL, AND COR-TEN® STEEL



- **VARIETY OF WIDTHS AND DOOR ARRANGEMENTS**
- **ALUMINUM, STEEL, OR COR-TEN® STEEL CONSTRUCTION**
- **DOORS ARE COMPLETELY REMOVABLE WHEN OPEN**

Safetran Instrument Shelters can be furnished in several sizes with a variety of door arrangements. Construction can be of aluminum, steel, or Cor-Ten® steel. Doors on these shelters; provided with hooks and clips to hold the door at either a 90 or 180 degree position, are completely removable when open. Door handles are designed to accept padlock or can be locked by means of an optional built-in locking screw using a standard terminal wrench. Ventilators are provided with covers at the top and bottom of the doors.

Holes are located in the floor (4-5/8 inch diameter) with two bottom bushings provided to allow wire entry into the shelter.

The walls are formed panels in two-foot sections with all seams sealed. Inside walls have vertical angles with punched keyslot holes for the mounting of shelf brackets, mounting boards, and wire chases with tag boards. Each shelter is equipped with a switch and duplex outlet located at the entrance door. An overhead light receptacle with pull chain and convenience outlet is provided. Wiring is not provided unless specified.

An aerial cable inlet and eyebolt, furnished with each shelter, can be mounted on either side or the front of the shelter.

Lifting rings, located at all four corners of the shelter, allow for lifting of the shelter onto foundation.

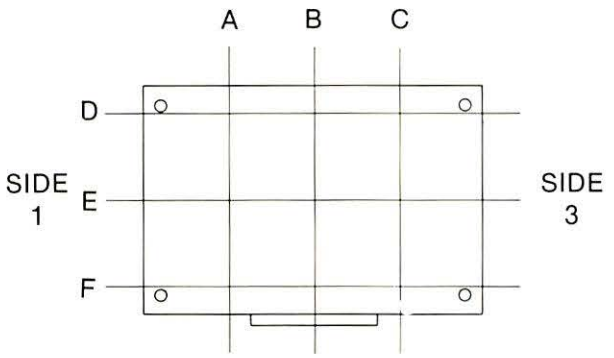
Aluminum instrument shelters are constructed of .100 inch aluminum sheeting. Steel and Cor-Ten® shelters are constructed of 12 and 14 gauge steel respectively.

Steel shelters are painted with primer and finished with aluminum paint on the exterior, and gray paint on the interior. Cor-Ten® steel shelters are finished the same as steel on the interior, but are unfinished on the exterior. The outermost surface of Cor-Ten® Steel oxidizes, providing a natural protective finish for the exterior of the shelter.

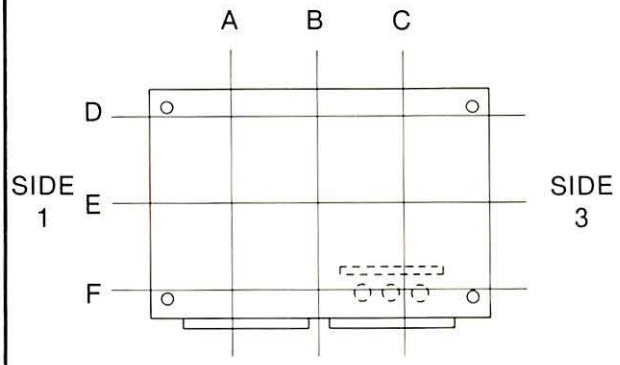
Interior can be lined with single (1/2 inch), double (1 inch), or high efficiency Thermax® (2 inch) insulation.

ORDERING INFORMATION

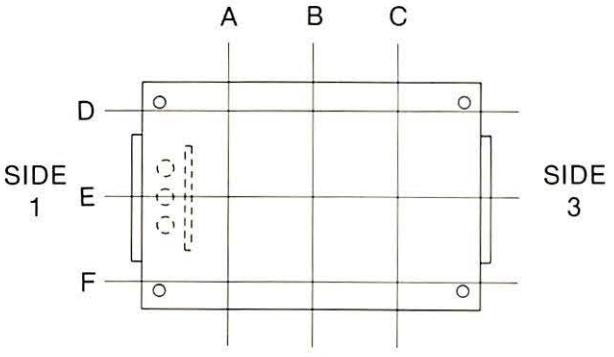
STYLE 1



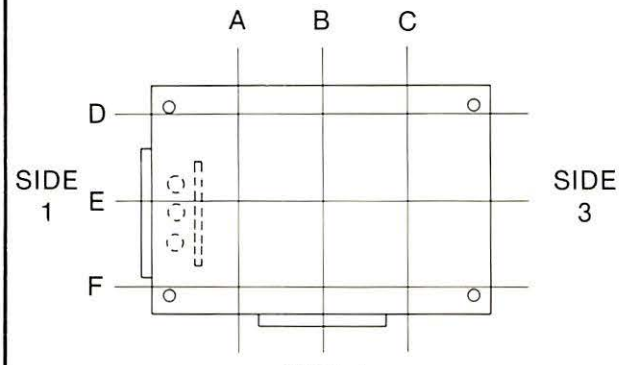
STYLE 2



STYLE 3



STYLE 4



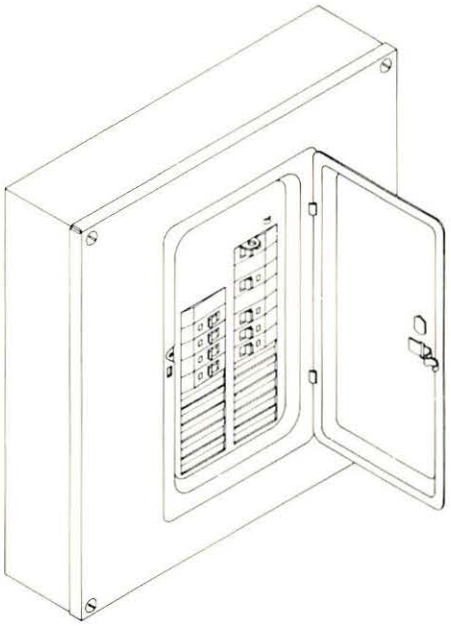
To Order: Specify the following:

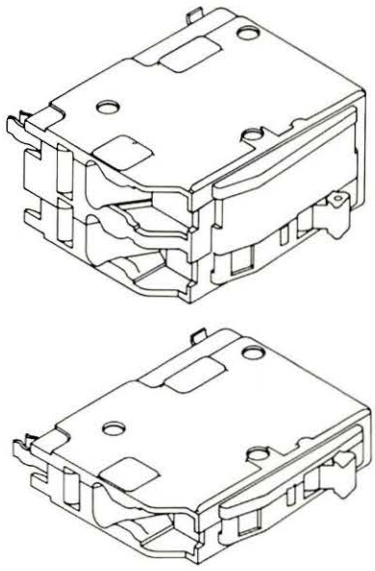
1. Either Aluminum, Steel, or Cor-Ten Steel Shelter.
2. Style of Shelter from above.
3. Size of Shelter, (see table below)
4. List accessories desired and location via above diagrams.
5. Insulation, if desired, either single (1/2 inch), double (1 inch), or high efficiency Thermax® (2 inch).
6. Terminal Board and Frame, if desired.
7. Foundation, see section F-3.

INSTRUMENT SHELTER DIMENSIONS

Shelter Size In Feet	Bolt Spacing In Inches	Size of Terminal Board Frame In Inches
4 x 6	40 x 64	22 x 82.5
6 x 6	64 x 64	36 x 82.5
6 x 8	64 x 68	48 x 82.5

WIRING PACKAGES





Wiring packages for Instrument Shelters include a 100 Amp service circuit breaker box with 12 breaker capacity. Also included are one circuit breaker for 120VAC equipment (including standard light fixture(s) and switch wired in) and two circuit breakers for 240VAC for equipment installed at factory. Vacant circuit breaker positions are filled with blanks. Additional circuit breakers may be ordered separately. All internal circuits are wired in conduit of appropriate size.

ORDERING INFORMATION

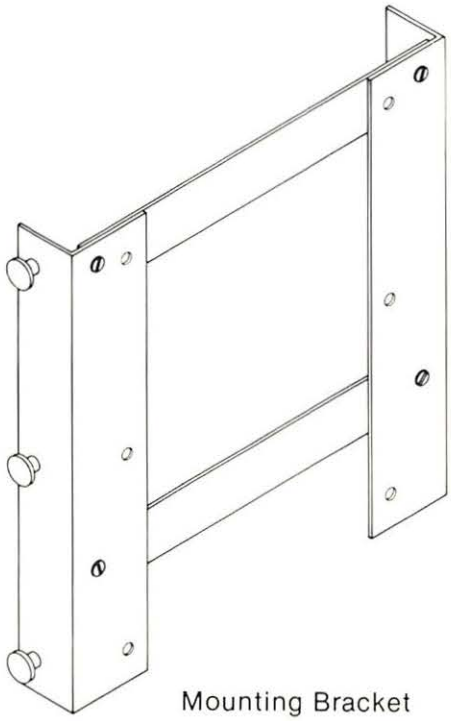
To Order: Specify Instrument Shelter Wiring Package and Part Number 051894-34X.

CIRCUIT BREAKERS

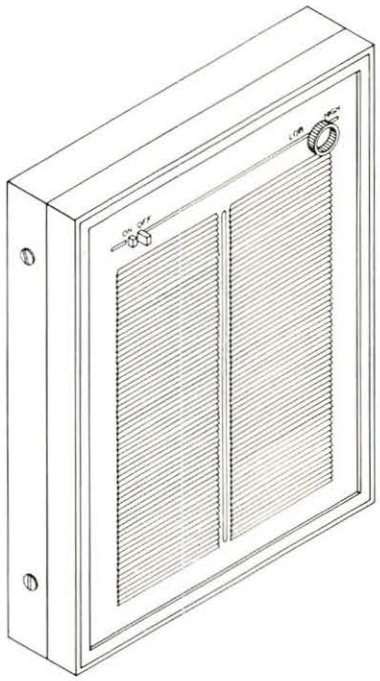
To Order: Specify Description and Part Number.

Description	Amp. Rating	Part Number	
		Single Pole	Double Pole
Circuit Breaker	15	7470-1B	7470-2B
Circuit Breaker	20	7471-1B	7471-2B

HEATING SYSTEMS



Mounting Bracket



Heating Unit

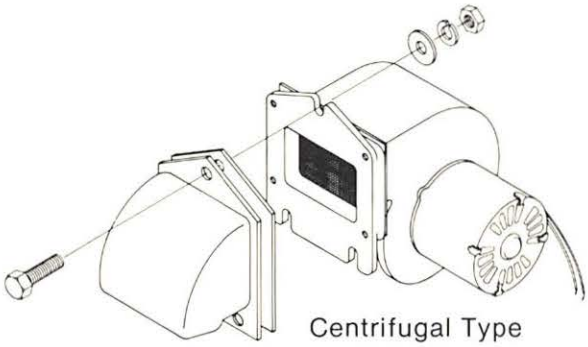
Wall Heaters feature safe and efficient cast aluminum heating grids and directional louvered cover for circulation of warm air at floor level for more even distribution. Wall Heaters may be purchased separately or with bracket to allow for mounting in Instrument Shelters using the keyslot mounting angles. They may also be ordered with shelter to be completely installed and wired in place with circuit breaker.

ORDERING INFORMATION

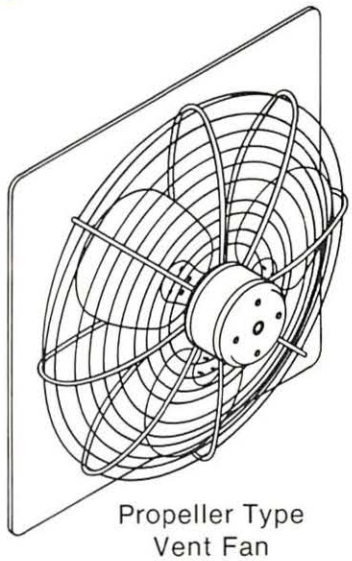
To Order: Specify Watts, Voltage and Part Number.

Watts	BTU	Voltage	Heater Only	Heater With Mt. Bracket	Heater Installed In Shelter
1500	5,122	120	051894-31	051894-31X	051894-31XF
1500	5,122	240	051894-28	051894-28X	051894-28XF
2000	6,830	240	051894-32	051894-557X	051894-32XF
3000	10,245	240	051894-33	051894-548X	051894-33XF
4000	13,660	240	051894-13	051894-13X	051894-13XF

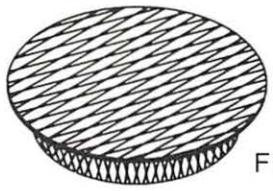
VENTILATION SYSTEM



Centrifugal Type
Vent Fan



Propeller Type
Vent Fan



Floor Vent

The Centrifugal Type Vent Fan consists of fan, mounting adapter, exhaust outlet, gaskets, and necessary hardware to allow mounting through standard knockout in any of the four corners of the shelter.

The Propeller Type Vent Fan consists of exhaust fan with louvered cover and intake louver assembly. The intake louver assembly contains a filtering system and outer protective screen. Both louvers open automatically when fan is operated. The exhaust fan will be mounted on any desired wall; with intake louver assembly mounted on opposite wall, at time of manufacture.

Both fan types are supplied with thermostat to allow control between 30 and 110 degrees Fahrenheit.

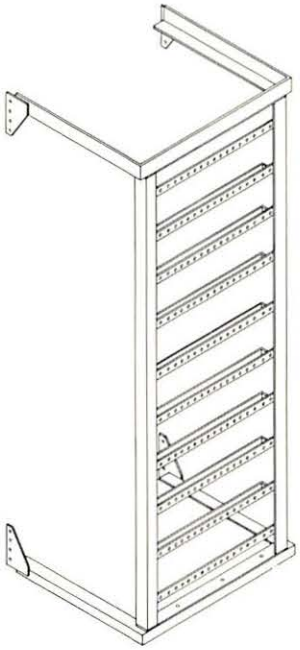
Also available are floor vents which are mounted in the floor at anchor bolt locations in the four corners of the shelter. They are constructed of a filter material enclosed within an expanded aluminum body.

ORDERING INFORMATION

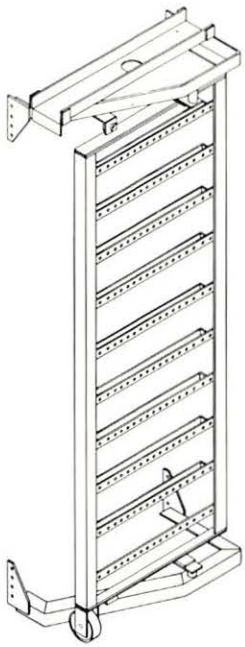
To Order: Specify Description and Part Number.

Description	Operation VAC	Exhaust CFM	Part Number
Centrifugal Type Vent Fan	110	148	035035-7X
Centrifugal Type Vent Fan	220	148	035035-503X
Propeller Type Vent Fan, 12″ Fan	115	650	051894-610X
Propeller Type Vent Fan, 16″ Fan	115	780	051894-611X
Chimney Mounted Vent Fan	120	360	051894-545X
Floor Vents (4 required)			050948-X

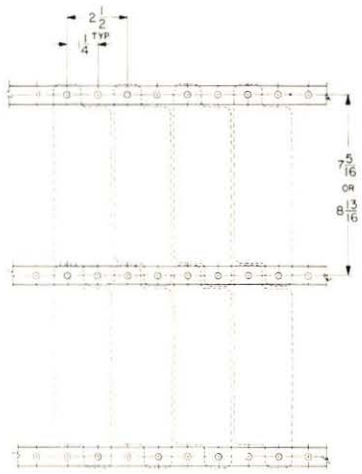
PLUG-IN RELAY RACKS



Stationary Type



Swing Type



Relay Mounting Arrangement

Plug-In Relay Racks are mounted into the vertical angles along the sides of either steel or aluminum instrument shelters. If desired, these racks may be factory installed through the center of the shelter.

Both the swing type and stationary type racks will accomodate plug-in relays with vertical spacing of 7-5/16 inches or 8-13/16 inches. Single size relay capacity on either rack is 81 when spaced at 7-5/16 inches, or 72 when spaced at 8-13/16 inches.

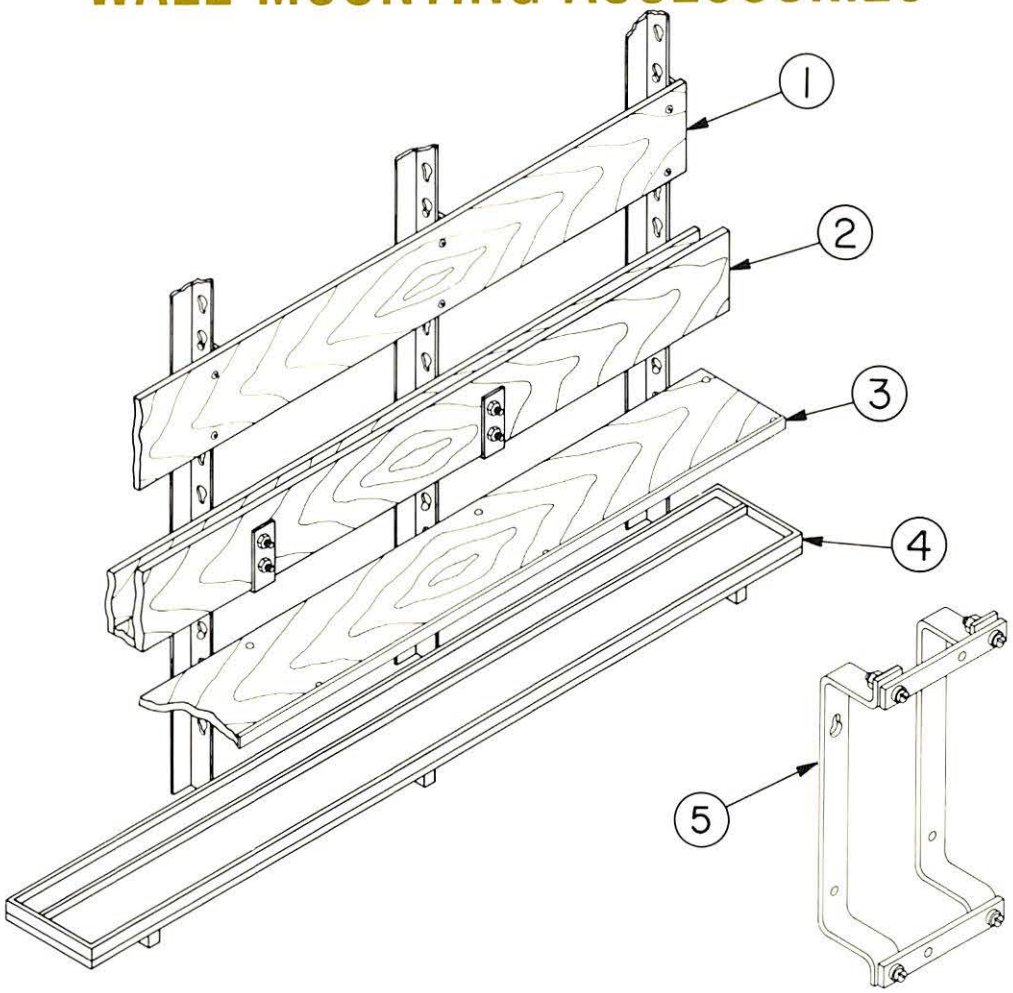
Racks will be shipped loose unless factory installation is specified.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Stationary Type Plug-in Relay Rack	051883-X
Swing Type Plug-in Relay Rack	051882-X

WALL MOUNTING ACCESSORIES



Mounting Board Assemblies are constructed of 3/4 inch painted wood.

Wire Chase and Tag Board Assemblies are of 3/4 inch wood. The inside dimensions of wire chase are 2-1/2 inches in width and 4-3/4 inches in depth.

Shelf Assemblies are constructed of 3/4 inch painted exterior plywood. Shelves are 11-7/8 inches in width.

Battery Trays are of 3/4 inch wood and coated with an acid resistant paint. They measure 12-1/8 inches in width and 4-1/4 inches in height.

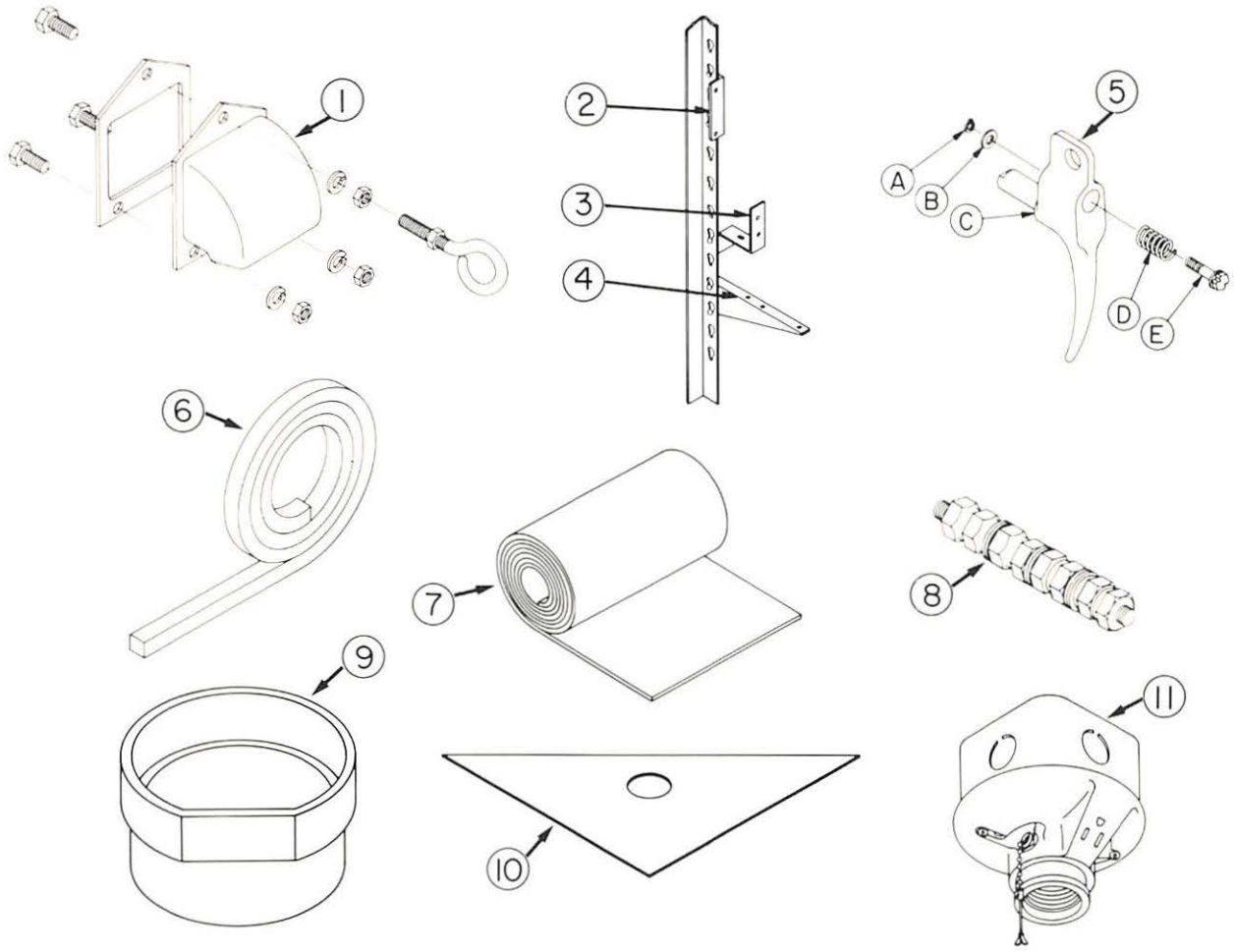
Wall mounting brackets are available for 1 to 4 plug-in relays. Hardware for mounting brackets to mounting board is included.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Mounting Board Assembly (specify height and length)	051867-513X
2	Wire Chase and Tag Board Assembly (specify length)	051843-503X
3	Shelf Assembly (specify length)	052829-500X
4	Battery Tray (specify length)	051950-555X
5	Wall Mounting Bracket for 1 Plug-in Relay	420000-51X
	Wall Mounting Bracket for 2 Plug-in Relays	420000-52X
	Wall Mounting Bracket for 4 Plug-in Relays	420000-53X

ACCESSORIES AND REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Inlet, Aerial Cable	035035-X
2	Bracket, Mounting Board (Includes Hardware)	051867-500X
3	Bracket, Shelf (Includes Hardware)	051843-501X
4	Bracket, Wire Chase and Tag Board (Includes Hardware)	052829-3X
5	Door Handle Assembly	051128-1AX
	Includes: A. Ring, Snap	7564
	B. Washer	051128-2
	C. Handle, Door	051128-5
	D. Spring	051150
	E. Bolt, Locking	051128-1X
6	Gasket, Door, .562″ x .75″ (specify length)	10-08-002
7	Mat, Rubber Floor, 36″ (specify length)	051806-504
8	Terminal, Ground	035049-X
9	Bushing, Bottom	035040
10	Pad, Base (for aluminum shelters only)	052838
11	Lamp	051154-500X

Safetran

INSTRUMENT CASES

ALUMINUM, STEEL AND COR-TEN® STEEL

- **VARIETY OF WIDTHS, HEIGHTS AND DOOR ARRANGEMENTS**
- **ALUMINUM, STEEL, OR COR-TEN® STEEL CONSTRUCTION**
- **DOORS ARE COMPLETELY REMOVABLE WHEN OPEN**

Safetran Instrument Cases can be furnished in several widths and heights with a variety of door arrangments. Construction can be of aluminum, steel, or Cor-Ten® steel. Doors on these cases, provided with hooks and clips to hold the door at either a 90 or 180 degree position, are completely removable when open. Door handles are designed to accept padlocks. Ventilators are provided with covers at the top and bottom of the doors.

Holes (4-5/8 inch diameter) are located in the floor to allow wire entry into the case. An aerial cable inlet and eyebolt can be mounted on either side of the case. Lifting rings, located at each end of the case, allow for lifting of the case onto foundation.

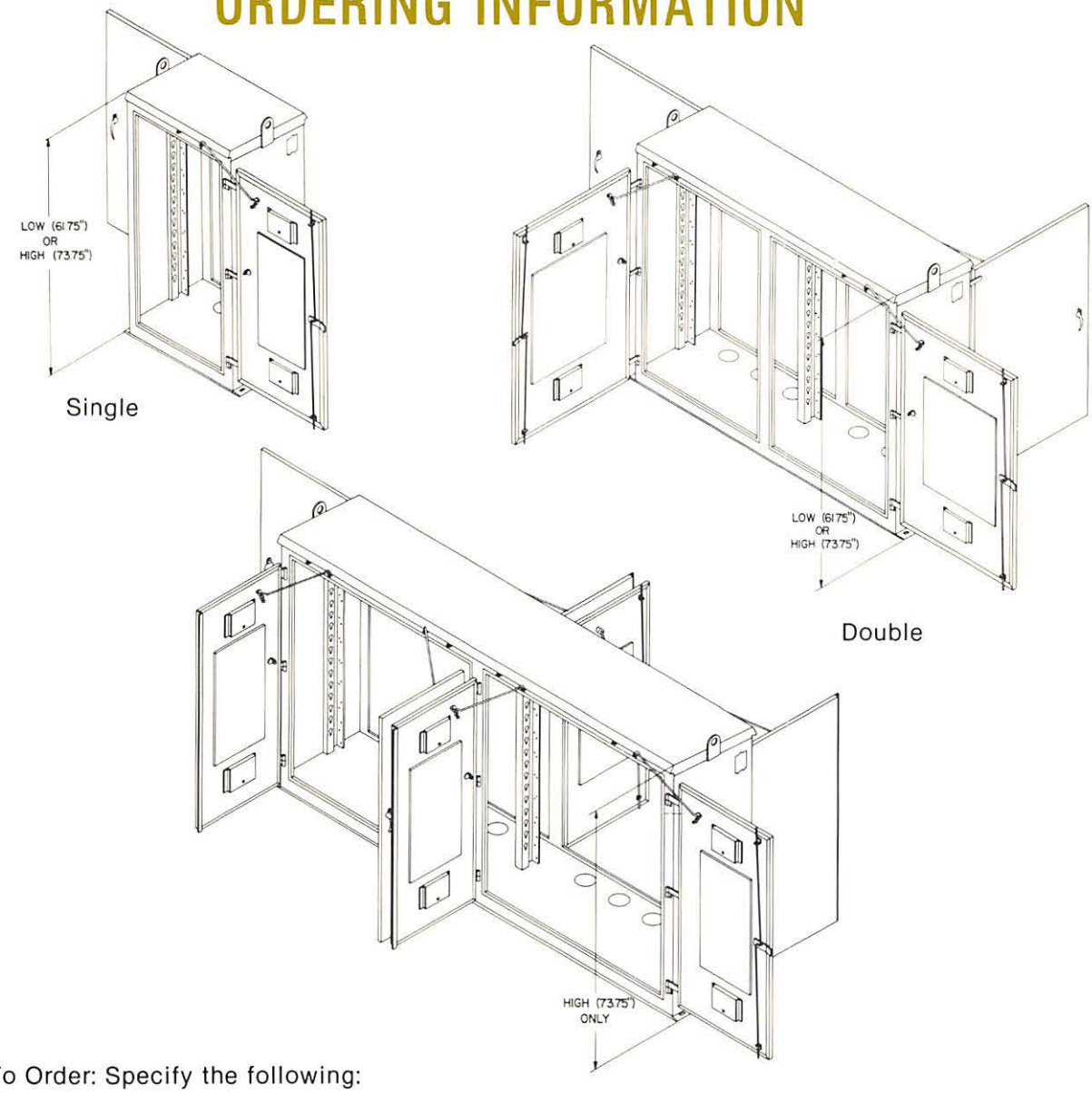
Vertical angles, located at each end of the case, have punched keyslot holes for mounting of shelves, mounting boards and wire ties.

The interior can be lined with 1/2 inch insulation if desired.

Aluminum instrument cases are constructed of .100 inch aluminum sheeting. Steel and Cor-Ten® steel cases are constructed of 12 gauge base, 14 gauge sides and doors, and 16 gauge top and back-board support panels.

Steel cases are painted with primer and finished with aluminum paint on the exterior, and gray paint on the interior. Cor-Ten® steel cases are finished the same as steel on the interior, but are unfinished on the exterior. The outermost surface of Cor-Ten® steel oxidizes, providing a natural protective finish for the exterior of the case.

ORDERING INFORMATION



To Order: Specify the following:

1. Type of Case, Dimensions in Inches, and Part Number from table below.
2. Accessories desired, (see pages E-3-3 and E-3-4).
3. Foundation (see section F-3)
4. Insulation (1/2 inch), if desired.

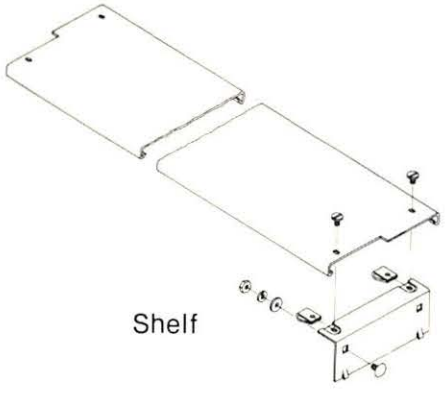
Type of Case	Dimensions in Inches			Number of Knockouts	Part Number		
	Width	Depth	Bolt Spacing		Aluminum	Steel	Cor-Ten® Steel
Low Single	31	24	34 x 18.5	2	545210-31X	567200-31X	569200-31X
High Single	31	24	34 x 18.5	2	545110-31X	567100-31X	569100-31X
Low Single	41	24	43.75 x 18.5	3	545210-41X	567200-41X	569200-41X
High Single	41	24	43.75 x 18.5	3	545110-41X	567100-41X	569100-41X
Low Double	60	24	61.25 x 18.5	4	545210-60X	567200-60X	569200-60X
High Double	60	24	61.25 x 18.5	4	545110-60X	567100-60X	569100-60X
Low Double	81	24	83.25 x 18.5	6	545210-81X	567200-81X	569200-81X
High Double	81	24	83.25 x 18.5	6	545110-81X	567100-81X	569100-81X
High Quadruple	116	24	118.25 x 18.5	8	545110-116X	567100-116X	569100-116X

BACK BOARDS

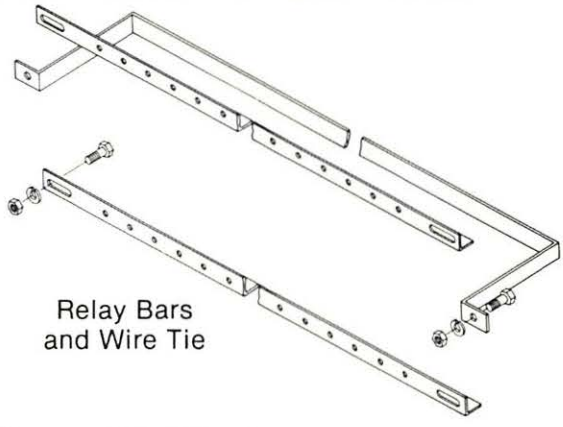
To Order: Specify Type of Case and Part Number.

Type of Case	Part Number	Type of Case	Part Number
Low Single (31″ Wide)	560026-1X	High Double (60″ Wide)	560026-4X
High Single (31″ Wide)	560026-X	Low Double (81″ Wide)	560026-7X
Low Single (41″ Wide)	560026-3X	High Double (81″ Wide)	560026-6X
High Single (41″ Wide)	560026-2X	High Quadruple (116″ Wide)	560026-8X
Low Double (60″ Wide)	560026-5X		

SHELVES, RELAY BARS AND WIRE TIES



Shelf



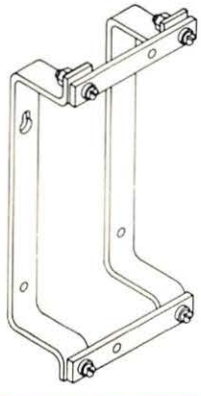
Relay Bars
and Wire Tie

To Order: Specify Width of Case and Part Number.

Width of Case In Inches	Part Number		
	Shelf	Relay Bar*	Wire Tie*
31 (full case)	560012-X	560024-X	560025-X
41 (full case)	560012-1X	560024-1X	560025-1X
60 (full case)	560012-2X	560024-4X	560025-3X
81 (full case)	560012-3X	560024-5X	560025-4X
116 (full case)	560012-4X	560024-6X	560025-5X
60 (half case)		560024-2X	560025-2X
81 (half case)	560012-1X	560024-3X	560025-1X
116 (half case)	560012-2X	560024-4X	560025-3X

* Two relay bars and one wire tie are required for the first row of relays. For each additional row of relays, add one relay bar and one wire tie. Necessary hardware is furnished.

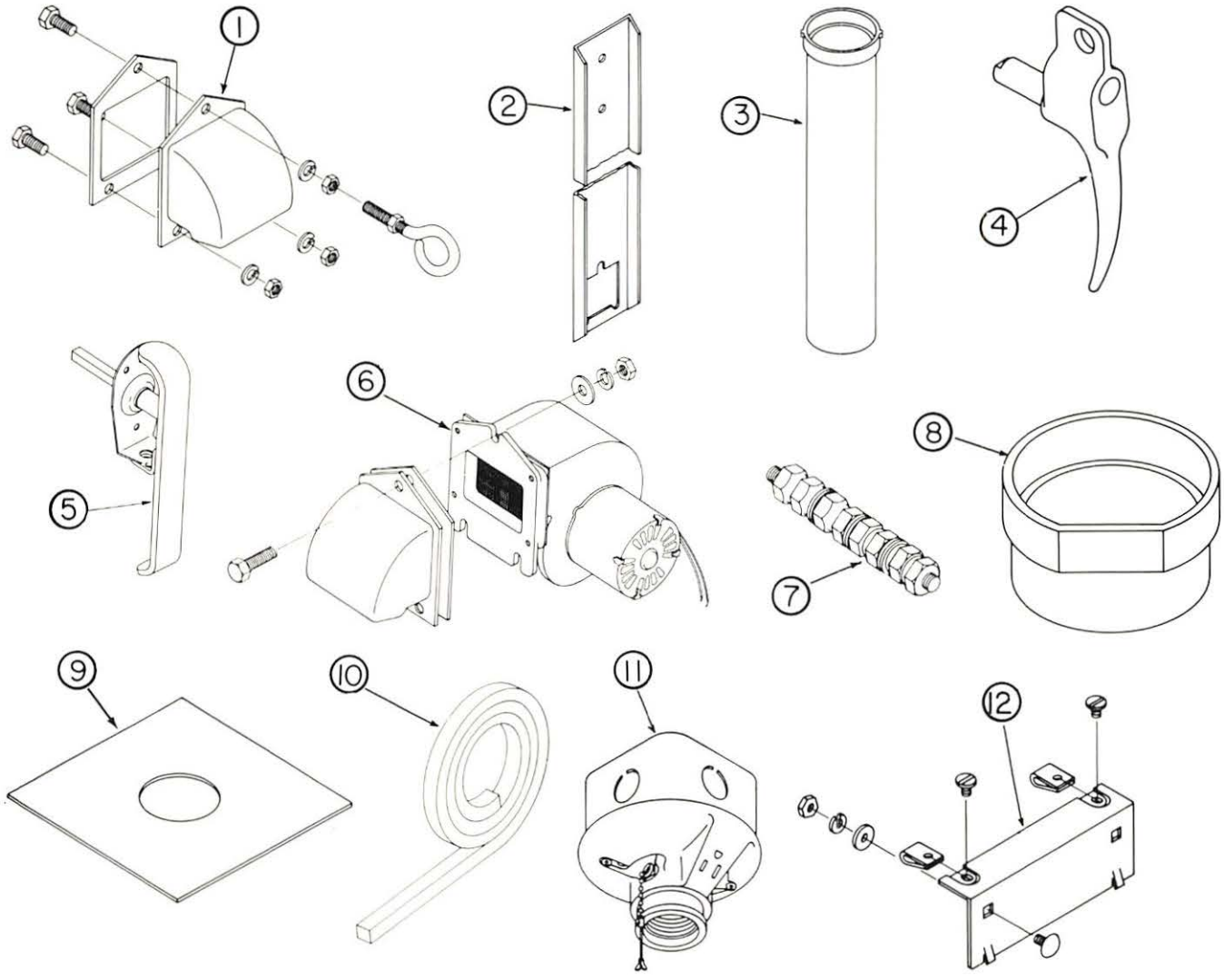
WALL MOUNTING BRACKETS FOR PLUG-IN RELAYS



To Order: Specify Description and Part Number.

Description	Part Number
Wall Mounting Bracket for 1 Plug-in Relay	420000-51X
Wall Mounting Bracket for 2 Plug-in Relay	420000-52X
Wall Mounting Bracket for 4 Plug-in Relay	420000-53X

ACCESSORIES AND REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Inlet, Aerial Cable	035035X
2	Support, Cable	051151-1
3	Riser, Cable	050971-X
4	Handle, Door (Cast-Iron) (Alum Case)	051128-AX
5	Handle, Door (Fabricated) (Stl Case)	567011
6	Fan, Ventilation, 110V	035035-7X
	Fan, Ventilation, 220V	035035-503X
7	Terminal, Ground	035049-X
8	Bushing, Bottom	035040
9	Pad, Base (for aluminum cases only)	050993
10	Gasket, Door, (Specify length required)	10-08-002
11	Lamp	051154-500X
12	Bracket, Shelf	051167-1X

Safetran

INSTRUMENT CASES

LIGHT TOP LOADING, HEAVY TOP LOADING

- **COMBINES SIGNAL MAST SUPPORT WITH INSTRUMENT CASE**
- **DOORS ARE COMPLETELY REMOVABLE WHEN OPEN**
- **VENTILATORS ARE LOCATED IN BOTH DOORS**
- **SHELVES AND LINING ARE OF WOOD CONSTRUCTION**

Safetran Top Loading Instrument Cases are available for either heavy or light top loading applications.

The base frame of these cases is constructed of plates which are formed into channels, and serve as anchor bolt adapters. Cases are furnished with both 23-7/8 x 23-7/8 and 23-7/8 x 30 inch bolt spacings.

The sides and doors are constructed of 12 gauge steel; whereas the top is of 7 gauge steel. The interior is painted grey and the exterior, including the cable post assembly, is painted aluminum.

Both doors are provided with hooks and clips to hold them open at 90 degrees. Doors are removable when open. The door handles are designed to accept padlock or lock by means of a built-in screw using a standard terminal wrench or spanner key. These doors are equipped with ventilators and covers to allow for proper ventilation.

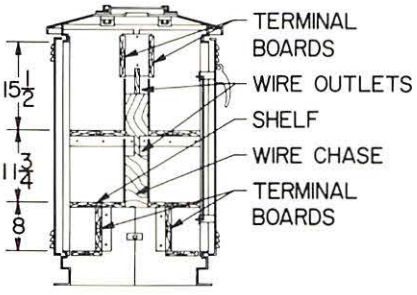
Door channels are packed with neoprene to provide a weathertight seal.

Interior lining, shelving, and bottom pull-up boards are of wood.

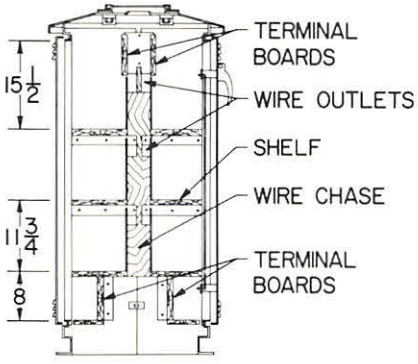
Terminal boards are located at top and bottom of wire chase. This wire chase is located in center of case with entry to 11 inch shelves on both sides of case.

Interior lining and/or shelving may be adapted to specific requirements. A sketch showing the arrangement in such instances should be furnished with your order or inquiry.

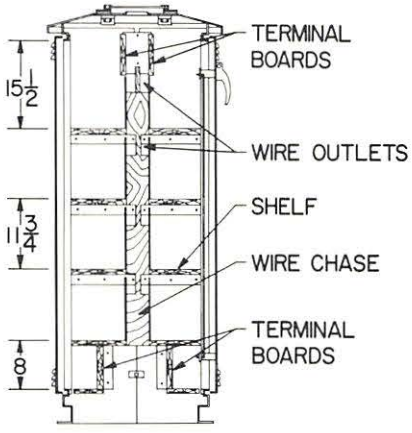
LIGHT TOP LOADING CASES ORDERING INFORMATION



Light Top Loading Case w/4 Shelves



Light Top Loading Case w/6 Shelves



Light Top Loading Case w/8 Shelves

The Light Top Loading Cases have two support bars located under the top, tapped for 7/8-9 studs for the mounting of cable posts or other light loading equipment. Studs for top of case mounting are furnished unless cover is ordered with case.

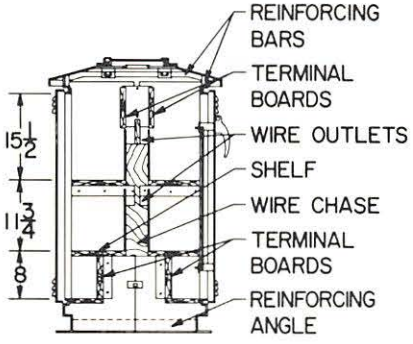
Cable Post Assemblies for top of case mounting can be furnished in either steel or aluminum construction.

For ordering information, see section E-9 of this catalog.

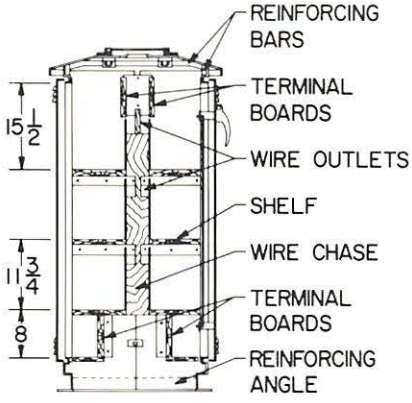
To Order: Specify Description and Part Number.

Description	Outside Dimensions In Inches			Part Number
	Height	Width	Depth	
Light Top Loading Case w/4 Shelves	45.75	29.375	39	051400-110X
Light Top Loading Case w/6 Shelves	56.75	29.375	39	051400-120X
Light Top Loading Case w/8 Shelves	68.75	29.375	39	051400-130X

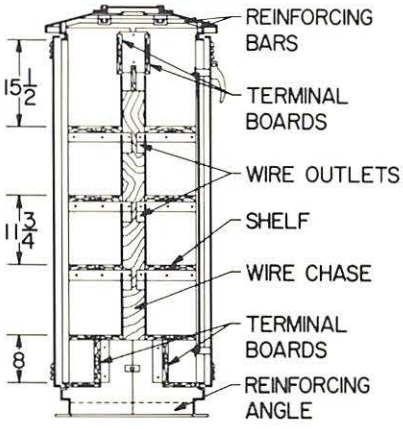
HEAVY TOP LOADING CASES ORDERING INFORMATION



Heavy Top Loading Case w/4 Shelves



Heavy Top Loading Case w/6 Shelves



Heavy Top Loading Case w/8 Shelves

The Heavy Top Loading Cases have steel reinforcements in both the top and bottom of case. Four support bars under the top are tapped for 7/8-9 studs for mast mounting.

Studs for top of case mounting are furnished unless cover is ordered with case.

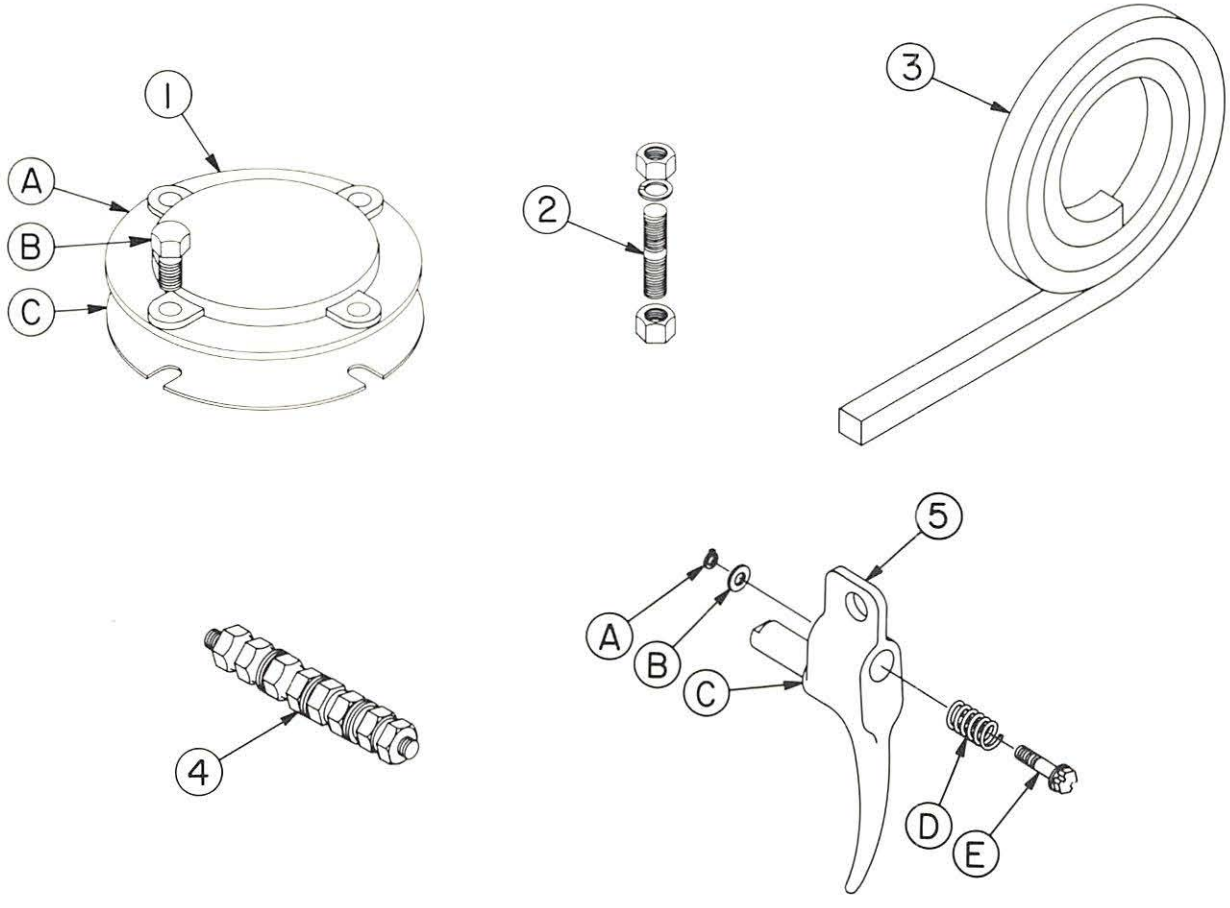
Cable Post Assemblies for top of case mounting can be furnished in either steel or aluminum construction.

For ordering information, see section E-9 of this catalog.

To Order: Specify Description and Part Number.

Description	Outside Dimensions In Inches			Part Number
	Height	Width	Depth	
Heavy Top Loading Case w/4 Shelves	45.75	29.375	39	051400-160X
Heavy Top Loading Case w/6 Shelves	56.75	29.375	39	051400-170X
Heavy Top Loading Case w/8 Shelves	68.75	29.375	39	051400-180X

TOP LOADING INSTRUMENT CASES REPLACEMENT PARTS



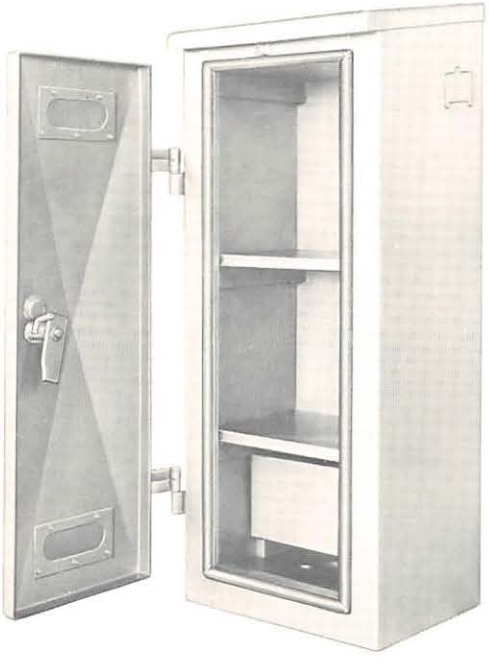
To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Cover Assembly	051411-X
	Includes: A. Cover	051411
	B. Cap Screw, Hex Head, 7/8″-9 x 2″	4306-HSC
	C. Gasket, Cover	051410
2	Stud Assembly	051414-X
3	Gasket, Door, .562″ x .75″ (specify length)	10-08-002
4	Terminal, Ground	035049-X
5	Door Handle Assembly	051128-1AX
	Includes: A. Ring, Snap	7564
	B. Washer	051128-2
	C. Handle, Door	051128-5
	D. Spring	051150
	E. Bolt, Locking	051128-1X

Safetran

INSTRUMENT CASES

WALL, WOOD POLE, OR PIPE MAST MOUNTED



- **CONSTRUCTION OF ALUMINUM, STEEL, OR COR-TEN® STEEL**
- **SIDES ARE LINED WITH WOOD**
- **AVAILABLE WITH SHELVES AND TERMINAL BOARD**

Instrument Cases are available in several heights with construction of either aluminum, steel, or Cor-Ten® steel. With appropriate brackets, these cases can be mounted to walls, wood post, or pipe mast.

Ventilators with covers are located at top and bottom of door. The door channel is fitted with neoprene gasket to form a weathertight seal. Door is removable when open. The door handle is designed to accept padlock or can be locked by means of a built-in screw using a standard terminal wrench.

One aerial cable inlet knockout is located on each side of the case.

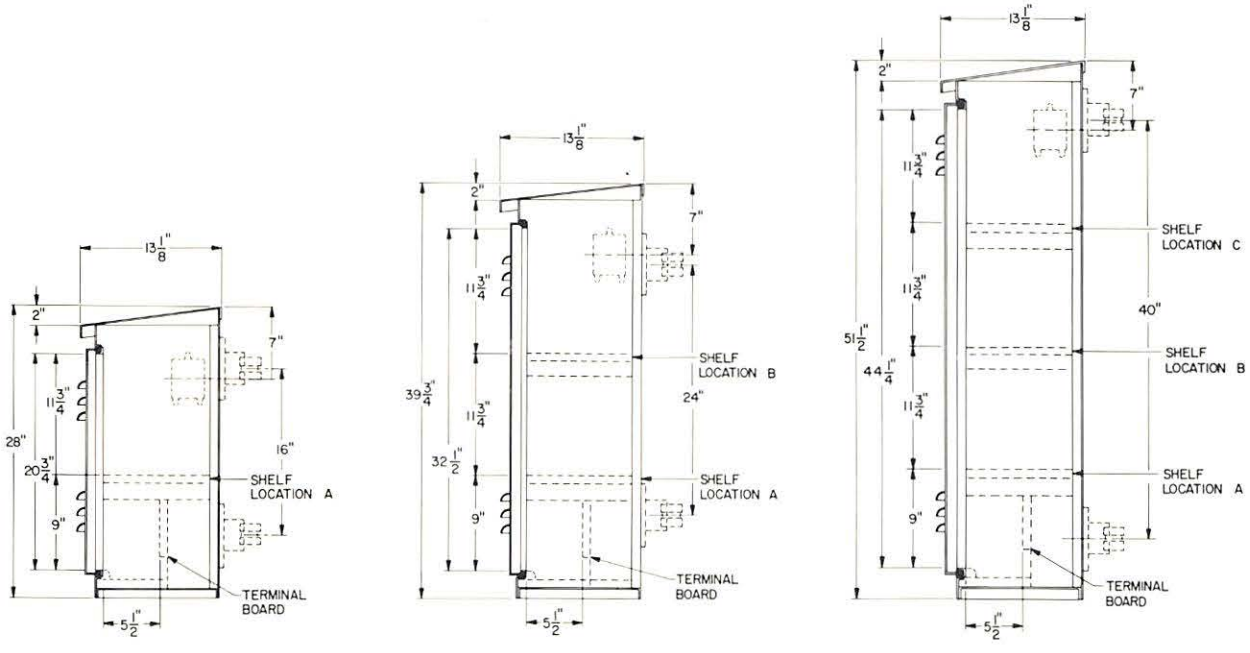
Bottom of case contains 3-9/16 inch diameter knockouts for location of optional cast aluminum bottom bushings.

Back and sides are lined with 3/4 inch wood. Shelves and terminal board, when furnished, are also of 3/4 inch wood.

Aluminum cases are constructed of .100 inch aluminum sheeting. Steel and Cor-Ten® steel cases are constructed of 12 gauge and 14 gauge steel respectively.

Steel cases are painted with primer and finished with aluminum paint on the exterior, and gray paint on the interior. Cor-Ten® steel cases are finished the same as steel inside, but are unfinished on the exterior. The outermost surface of Cor-Ten® steel oxidizes, providing a natural protective finish for the exterior of the case.

ORDERING INFORMATION

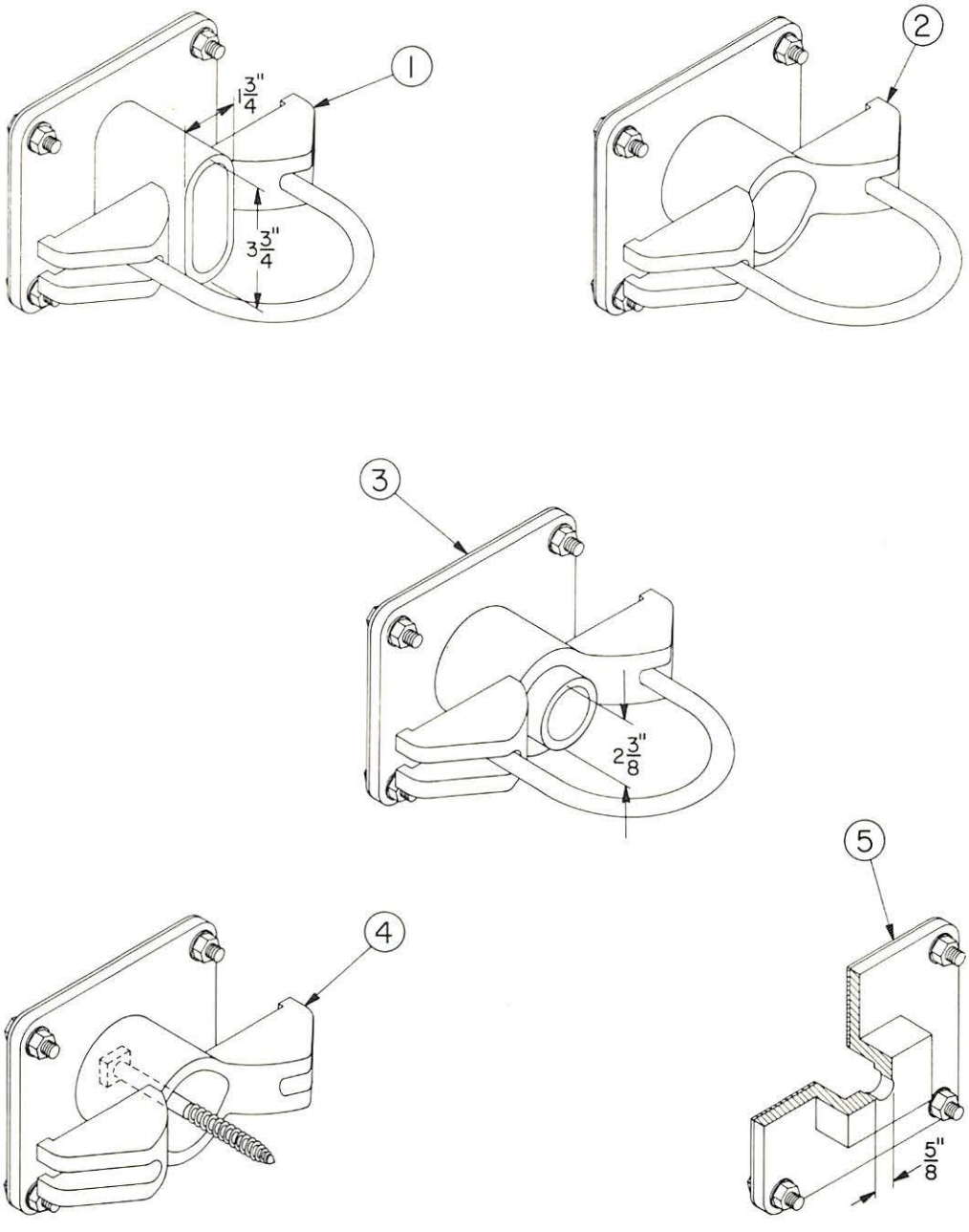


To Order, Specify the following:

1. Dimensions in Inches and Part Number from table below.
2. If shelves and terminal board are desired, specify via above diagrams.
3. List by description and part number accessories and type of mounting brackets desired.

Dimensions In Inches			Number Of Knockouts	Part Number		
Height	Width	Depth		Aluminum	Steel	Cor-Ten®
28	15.75	13.75	2	051270-210	051200-210	051250-210
39.75	15.75	13.75	2	051270-220	051200-220	051250-220
39.75	23.75	13.75	3	051270-230	051200-230	051250-230
39.75	28.25	13.75	3	051270-240	051200-240	051250-240
51.5	28.25	13.75	3	051270-250	051200-250	051250-250

MOUNTING BRACKETS

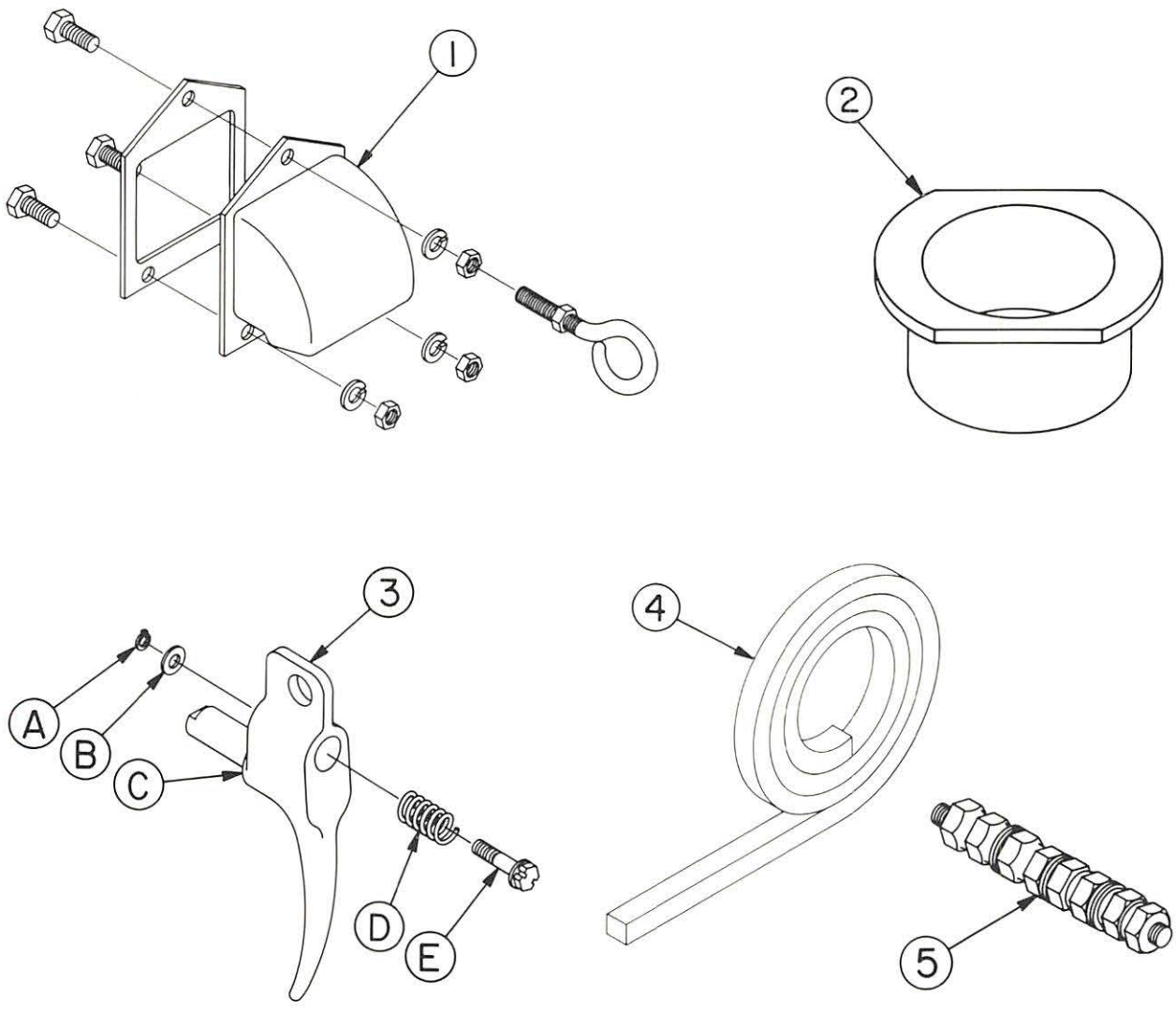


To Order: Specify Application and Part Number.

Item Number	Application	Required Hole Size In Pipe Mast In Inches	Part Number
1	4 Inch Pipe*	2 x 4	035021-X
2	4 Inch Pipe*	None	035023-X
3	4 Inch Pipe*	2-1/2 Diameter	035023-1X
4	Wood Pole	None	035023-2X
5	Wall or Concrete Post	None	035030-X

* Adapters for mounting to 5 and 8 inch pipe masts will be furnished upon request.

ACCESSORIES AND REPLACEMENT PARTS

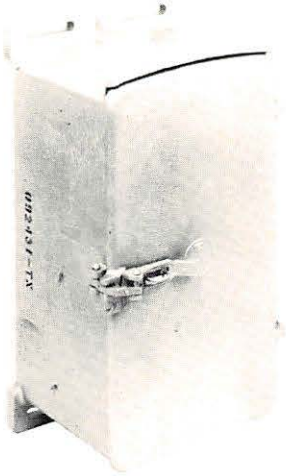


To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Inlet, Aerial Cable	035035-X
2	Bushing, Bottom	035041
3	Door Handle Assembly	051128-1AX
	Includes: A. Ring, Snap	7564
	B. Washer	051128-2
	C. Handle, Door	051128-5
	D. Spring	051150
	E. Bolt, Locking	051128-1X
4	Gasket, Door, .562″ x .75″ (Specify Length)	10-08-002
5	Terminal, Ground	035049-X

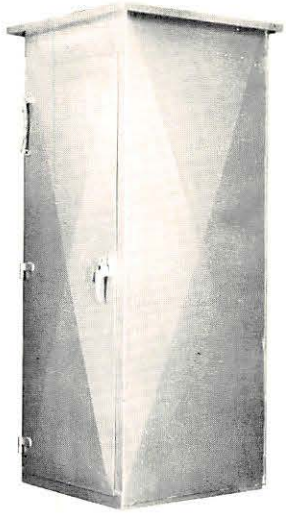
Safetran

TELEPHONE BOOTHS AND BOXES



Cast Telephone Box

Fabricated Telephone Box



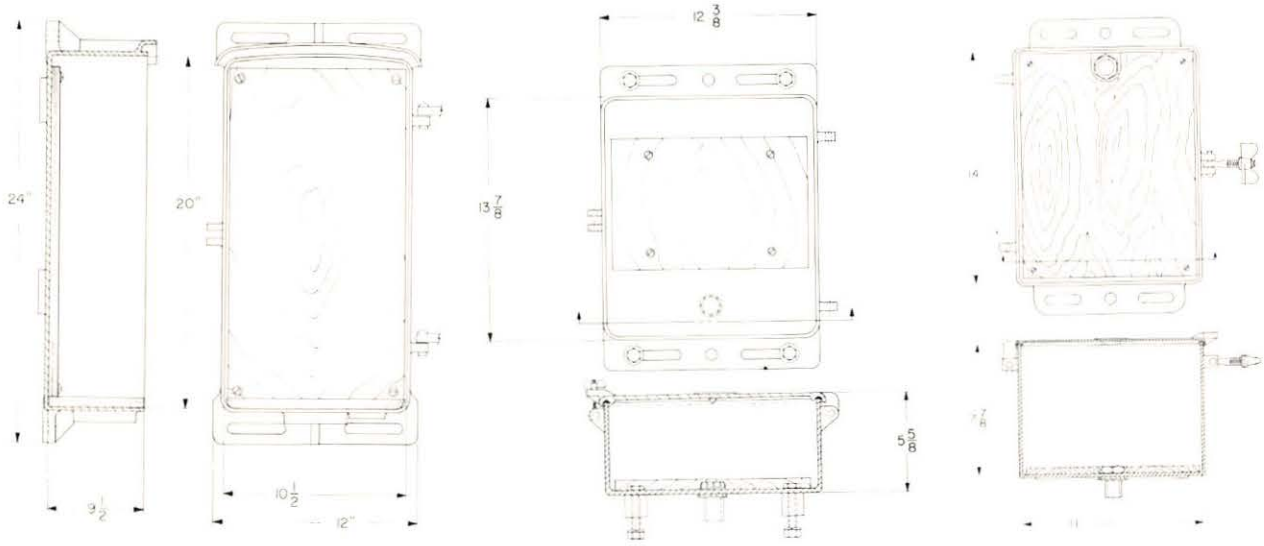
Telephone Booth

Safetran Telephone Boxes are available in both cast or fabricated steel construction for wall, pole, or pipe mast mounting. They may be furnished with a variety of door arrangements and locking devices. Wood mounting boards are furnished for the mounting of apparatus within these boxes.

Safetran Telephone Booths are of fabricated steel construction, finished with aluminum paint inside and out. The doors have a spring closing device and lock via locking bolt in door handle using terminal wrench or spanner key. A hoisting eye located on top of these booths allow for lifting onto foundation.

TELEPHONE BOXES

CAST ALUMINUM



TYPE 431 TYPE 533 TYPE 568

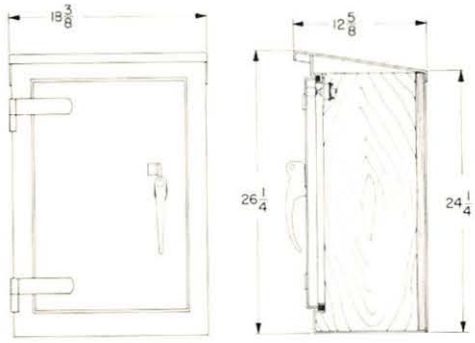
Safetran Cast Aluminum Telephone Boxes are designed for wall, pole, or pipe mast mounting. The type 431 box has hasp arrangement for closing; where as, the types 533 and 568 have wing nut closing devices. All three types will accept padlock. They are furnished with neoprene door gaskets to provide a weathertight seal. Wood mounting boards are furnished for mounting of apparatus within the boxes.

ORDERING INFORMATION

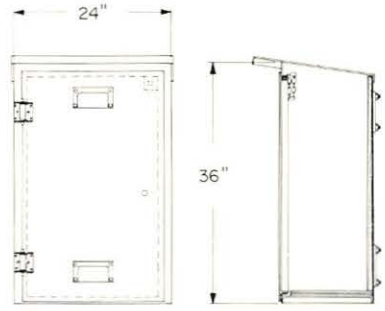
To Order: Specify Description and Part Number.

Description	Inside Dimensions in Inches			Part Number
	Height	Width	Depth	
Telephone Box, Type 431	20	10.5	9.5	092431-TX
Telephone Box, Type 533	13.75	12.25	5.5	092533-30TX
Telephone Box, Type 568	14	11	7.75	092568-TX

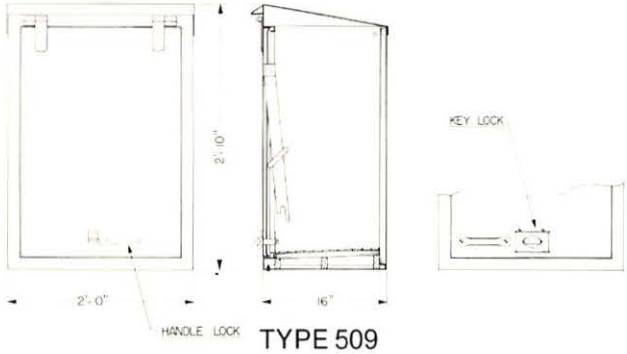
TELEPHONE BOXES
FABRICATED STEEL



TYPE 350



TYPE 361



TYPE 509

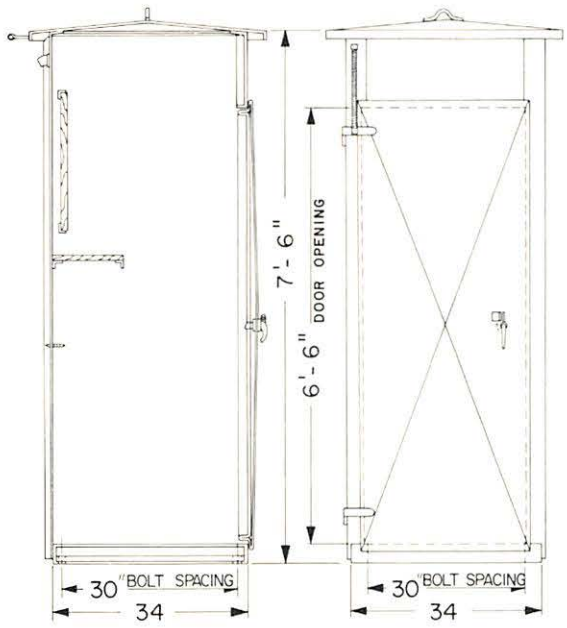
Safetran Telephone Boxes are constructed of 14 gauge steel formed and welded together. These boxes are primed and finished with aluminum paint on the outside, gray on the inside, and are lined with wood. The Model 350 and 509 boxes have doors which lock via a lock bolt in the door handle using standard terminal wrench or spanner key. The top hinge position on the Model 509 box allows the door to be raised up forming a shelter, with a brace holding the door in the raised position. The Model 361 box has a door with spring loaded hinges for self-closing. A key retaining lock can be provided in place of the door handle lock arrangements. Once opened, the key cannot be removed from the lock unless the box is closed. This not only prevents a telephone box from being left open, but minimizes key loss as well. These locks will be made for switch key supplied by customer at time of manufacture.

ORDERING INFORMATION

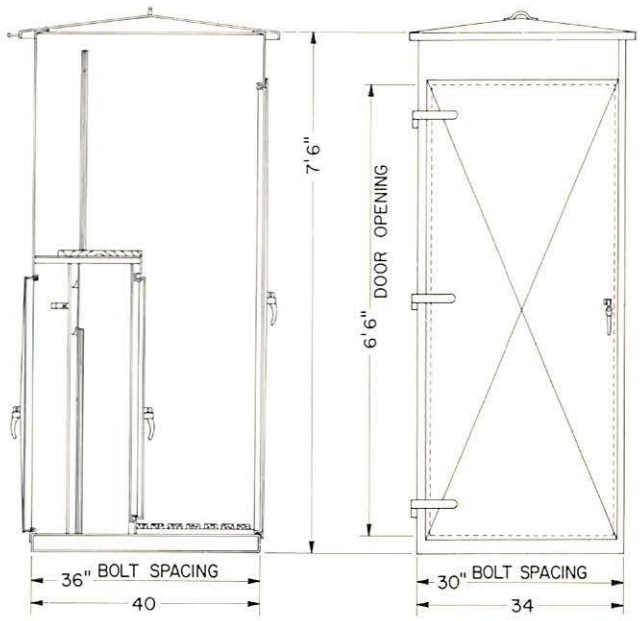
To Order: Specify Description and Part Number.

Description	Inside Dimensions in Inches			Part Number
	Height	Width	Depth	
Telephone Box, Type 350	24	16.5	8.5	051300-350X
Telephone Box, Type 361	32	23.5	12	051300-361X
Telephone Box, Type 509 w/Handle Lock	29	23.5	14	050700-509TX
Telephone Box, Type 509 w/Key Lock	29	23.5	14	050700-5091TX

TELEPHONE BOOTHS



TYPE 300



TYPE 302

Safetran Telephone Booths are constructed of fourteen gauge steel formed and welded together. The doors have a spring closing device and lock via lock bolt in the door handle using a terminal wrench or spanner key. A provision for padlock is also provided in the door handle. These assemblies are primed and finished with aluminum paint inside and out. The type 302 booth includes a double entry relay cabinet with backboard and racks for plug-in type relays. Both booths are furnished with eyebolt for line drop fastening, an aerial cable inlet, ground screw, terminal board, and wood shelf for writing convenience.

A hoisting bar located on top of these booths allow for lifting onto foundation.

To Order: Specify Description and Part Number.

Description	Inside Dimensions in Inches			Part Number
	Height	Width	Depth	
Telephone Booth, Type 300	84	34	34	051300-300X
Telephone Booth, Type 302	84	34	40	051300-302X

APPARATUS AND CABLE TERMINATION BOXES

PIPE, POLE, WALL, OR CROSSARM MOUNTED

- VARIETY OF SIZES AND CONSTRUCTION
- VARIETY OF ACCESSORIES AND EQUIPMENT AVAILABLE
- GASKET IN COVER PROVIDES WEATHERTIGHT SEAL

These boxes have been adapted for pipe, pole, wall, or crossarm mounting with appropriate fastenings of clamps, hooks, or U-bolts as required. These boxes are available in cast iron, cast aluminum, or in some cases, either.

Hinge and hasp fittings are of bronze for cast iron boxes, and are of aluminum for aluminum boxes.

The careful machining of these castings assures proper alignment of covers to housings. Gaskets are located between the cover and box to provide a weathertight seal.

Available for use with these boxes are a variety of connectors, adapter plates, outlets, ventilators, and lead knockouts. Equipment to be used in these boxes, such as terminals, arrestors, resistors, etc., may be found in their appropriate sections of this catalog.

Terminal boards of 3/4 inch wood, mounted in bottom of box, can be supplied for mounting of equipment.

ORDERING INFORMATION

To Order: Specify the following:

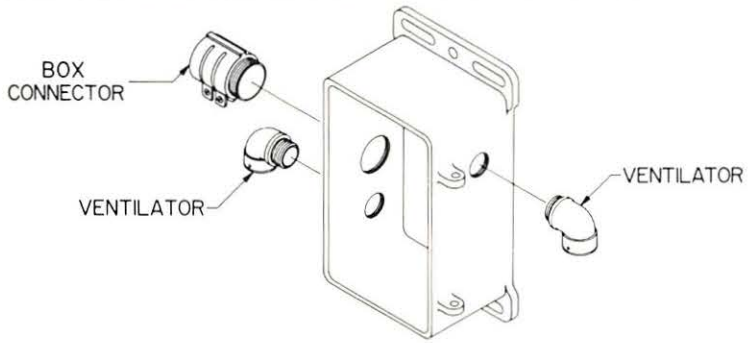
1. Select box desired (see pages E-7-2 through E-7-7), and specify how box is to be mounted.
2. Terminal board if desired.
3. Accessories (see pages E-7-8 through E-7-12) and equipment required.
4. Openings required and their locations via illustrations. See example, page E-7-3.
5. Terminals required (see seciton K-1).

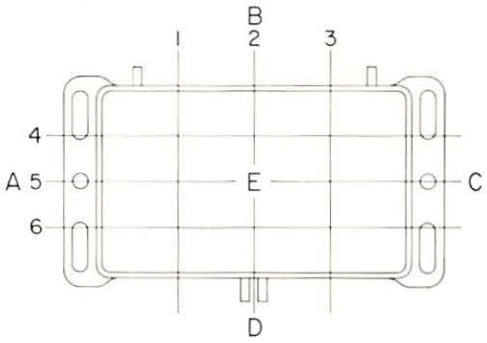
ORDERING INFORMATION

To Order: Specify Dimensions in Inches, Material and Part Number.

Dimensions in Inches			Material	Part Number
3-1/4	4-15/16	3-7/16	Aluminum	092569-BX
3-1/2	3-1/2	3-5/16	Iron	092382-ABX
3-3/4	3-3/4	8-1/2	Iron	092382-BBX
4-3/8	6-5/8	3-3/4	Iron	092399-BX
5-7/8	5	3-17/32	Aluminum	151506-BX
5-7/8	5	3-17/32	Aluminum	151504-BX
7	10	4	Aluminum	092607-ABX
7	10	5-1/2	Aluminum	092607-BBX
7	14	5-1/2	Aluminum	092469-BBX
7	9	3-1/2	Aluminum	092425-ABX
7	9	5-1/2	Aluminum	092425-BBX
7	9	5-1/2	Aluminum	092480-BBX
7	10	4	Aluminum	092307-CBX
7	10	5-1/2	Aluminum	092307-BBX
7	10	5-1/2	Aluminum	092307-GBX
7	10	8	Aluminum	092307-EBX
7	10	9-1/2	Aluminum	092307-FBX
7	10	5-1/2	Aluminum	092307-HBX
8-1/2	18-1/2	5	Iron	092315-BBX
9	12	5	Aluminum	092415-BX
9	18	5-1/2	Aluminum	092487-BX
10-1/2	20	5-1/2	Aluminum	092431-ABX
10-1/2	20	9-1/2	Aluminum	092431-BBX
11	14	7-7/8	Aluminum	092568-BX
12	13-1/2	4	Aluminum	092436-BX
12	13-1/2	5	Aluminum	092533-ABX
13	18-5/8	5	Aluminum	092224-BBX
16	22-1/2	5-3/4	Aluminum	092446-BX
17	28	9-1/2	Aluminum	092494-BX

APPARATUS AND CABLE TERMINATION BOXES



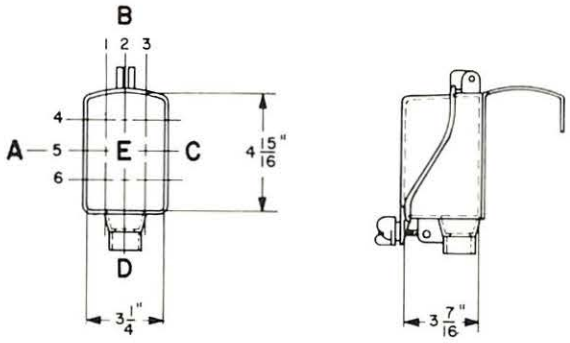


To order box as shown in example, the following data should be given on your order.

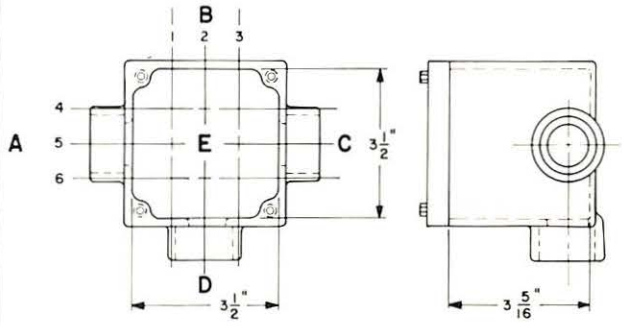
(1) Cable Termination Housing, Part Number 092307-B.

(2) Box Connector, Part Number 7318, at D-2.

(3) Ventilators, Part Number 091313-15X, at B-1 and D-3.



092569-BX



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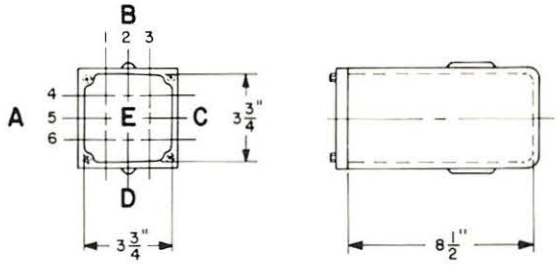
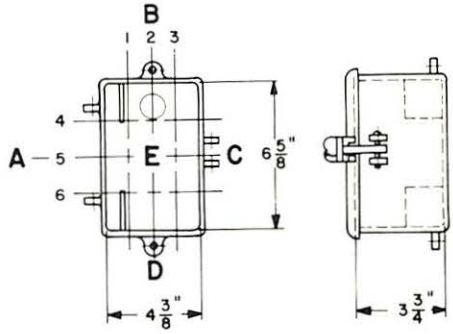


092382-BBX



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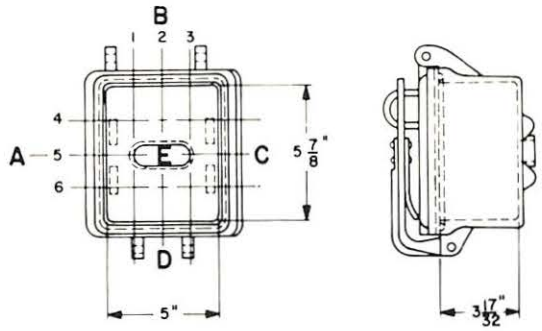

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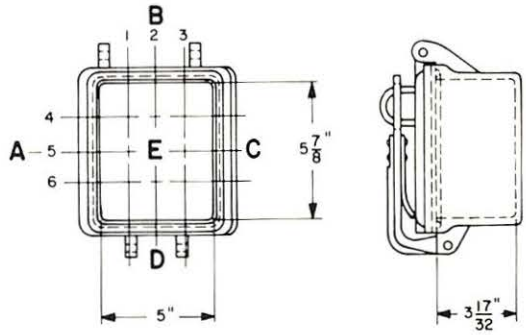

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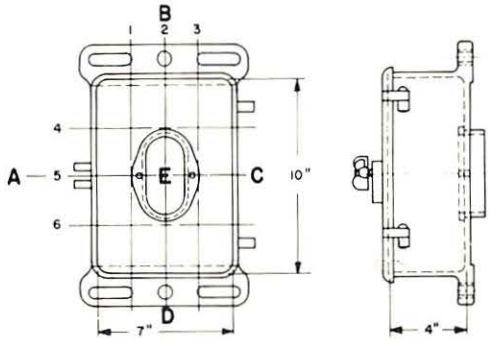

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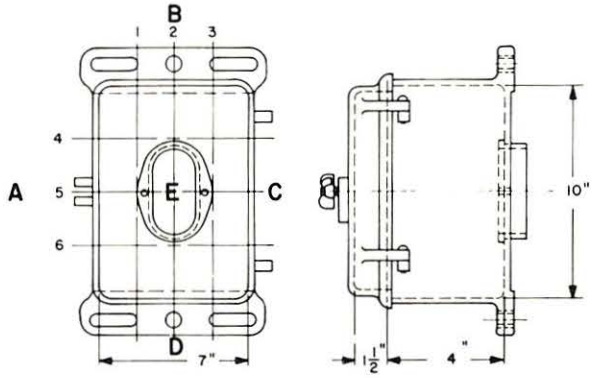

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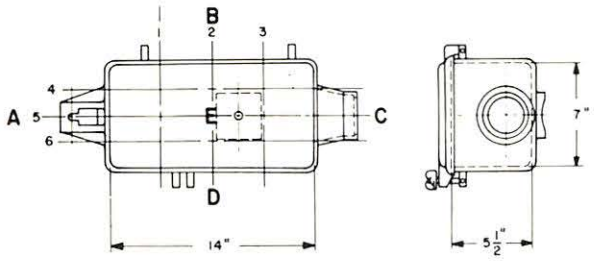

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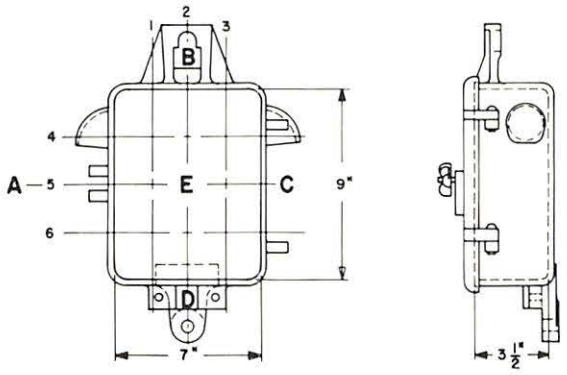

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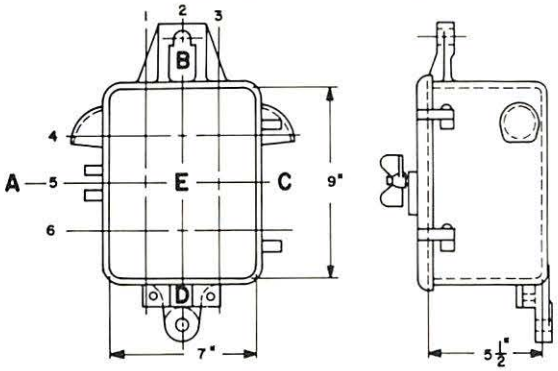

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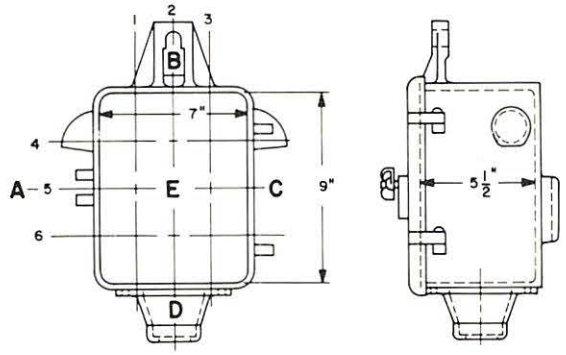

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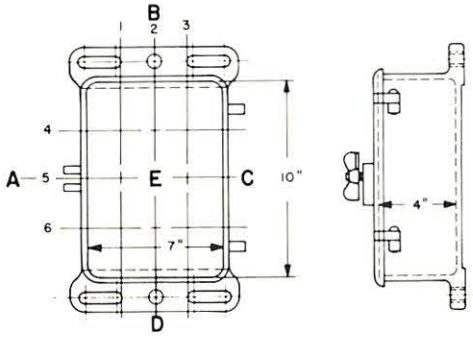

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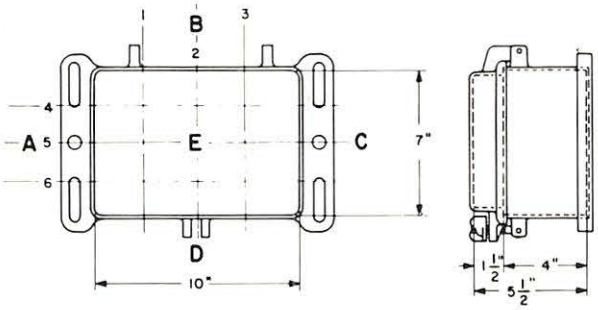

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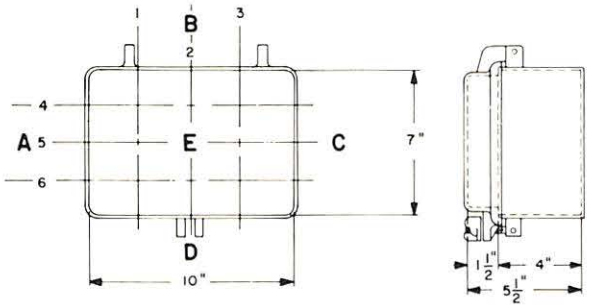

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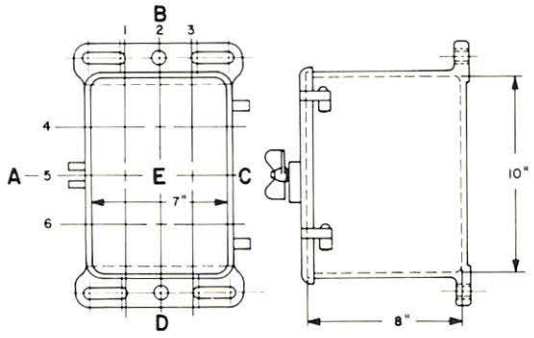

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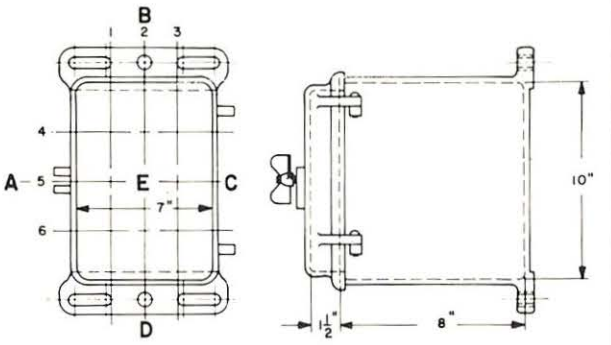

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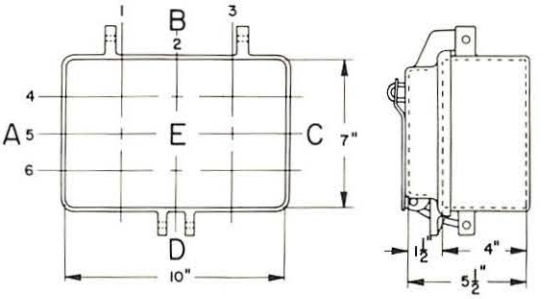

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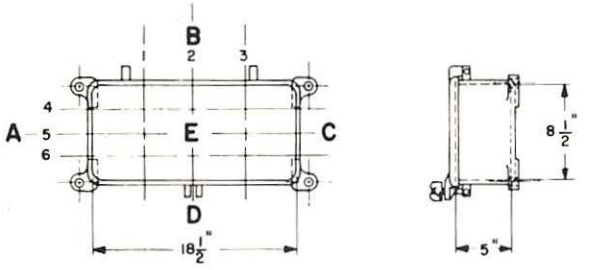

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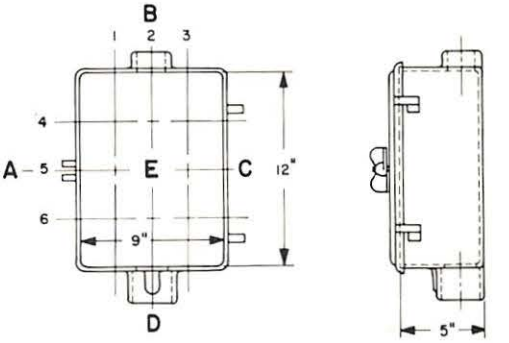

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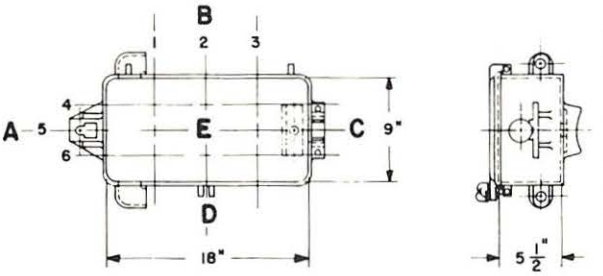

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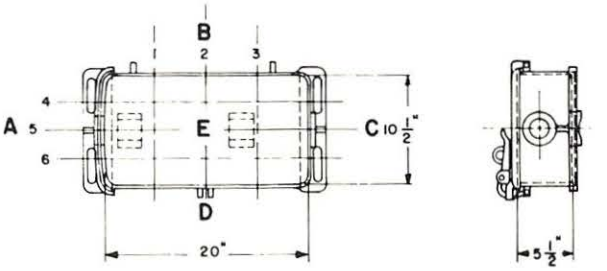

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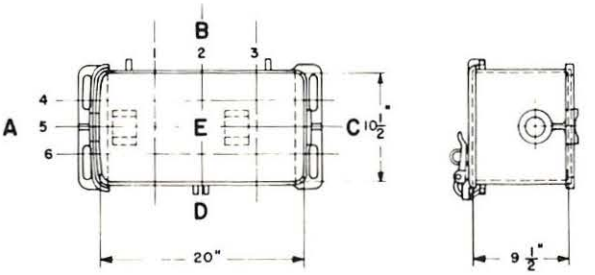

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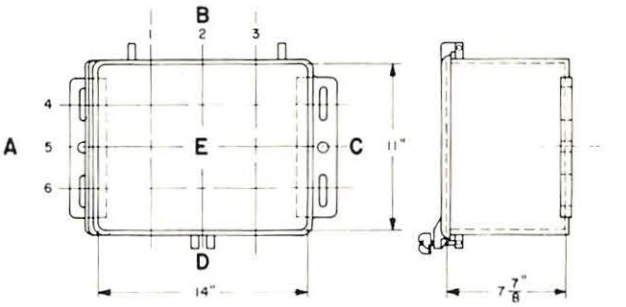

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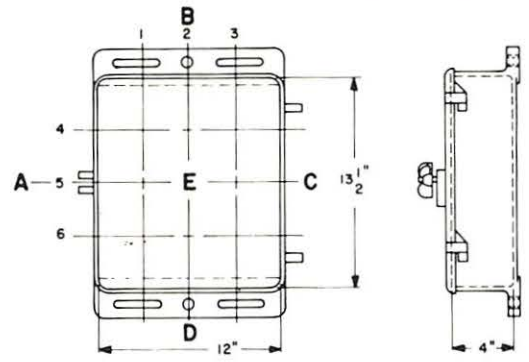

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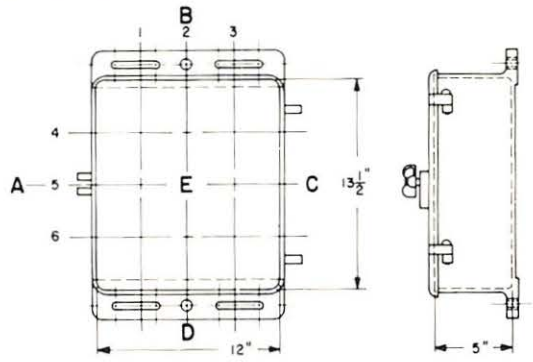

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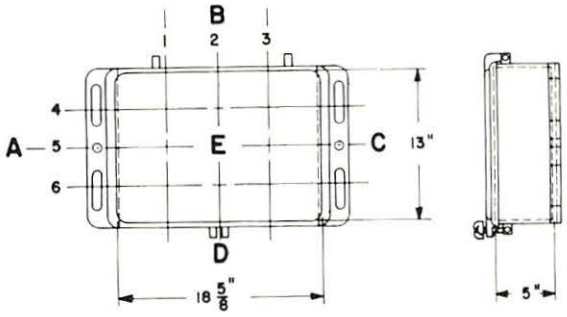

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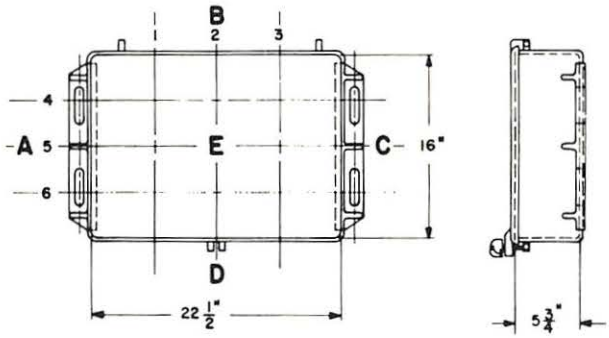

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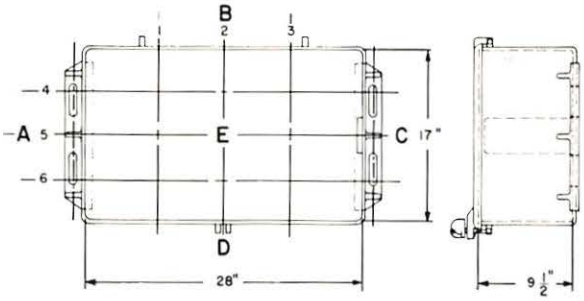


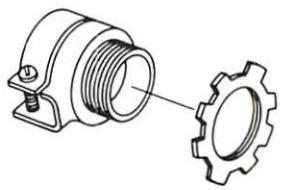
092494-BX

CAST LEAD KNOCKOUTS

Cast lead knockouts are used to plug drilled or tapped holes in cast boxes. Knockouts may be installed in a new box when drilled or tapped hole may be needed for future use.

For Ordering Information, See top of next page.

FLEXIBLE METALLIC CONDUIT AND BOX CONNECTORS



ORDERING INFORMATION

To Order: Specify Conduit Size in Inches and Part Number.

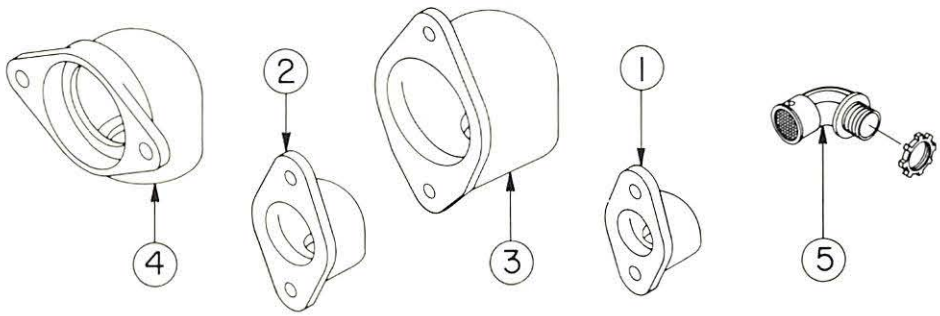
Conduit Size In Inches	Part Number	
	Box Connector	Flexible Conduit
.375	7335	7255
.500	7323	7259
.750	7317	7265
1.000	7324	7263
1.250	7320	7266
1.500	7318	7257
2.000	7319	7261
2.500	7355	7269

CAST LEAD KNOCKOUTS
ORDERING INFORMATION

To Order: Tapped or Drilled Hole Application and Part Number.

Maximum Grip In Inches	Tapped Hole Application In Inches	Drilled Hole Application In Inches	Part Number
5/16	1/2 NPT	3/4 Diameter	094538-9
5/16	3/4 NPT	27/32 Diameter	094538-8
5/16	1 NPT	1-1/16 Diameter	094538-7
5/16	1-1/4 NPT	1-5/16 Diameter	094538-3
5/16	1-1/2 NPT	1-11/16 Diameter	094538-5
5/16	—	1-15/16 Diameter	094538-4
5/16	2 NPT	2-7/16 Diameter	094538-2
9/16	2 NPT	2-7/16 Diameter	094538-6
5/8	2-1/2 NPT	3 Diameter	094538-12
9/16	3 NPT	3-1/2 Diameter	094538-10
1-1/16	—	4-1/8 x 1-9/16 Oblong	094538-1

OUTLETS AND VENTILATOR



Outlets (Items 1 and 2 listed below) include gaskets and mounting hardware for 5/16 - 18 tapped holes spaced at 2-11/32 inches and 3-3/16 inches respectively.

Outlets (Items 3 and 4 listed below) include gaskets, maple bushings, and mounting hardware for 3/8-16 tapped holes spaced at 4-1/8 inches.

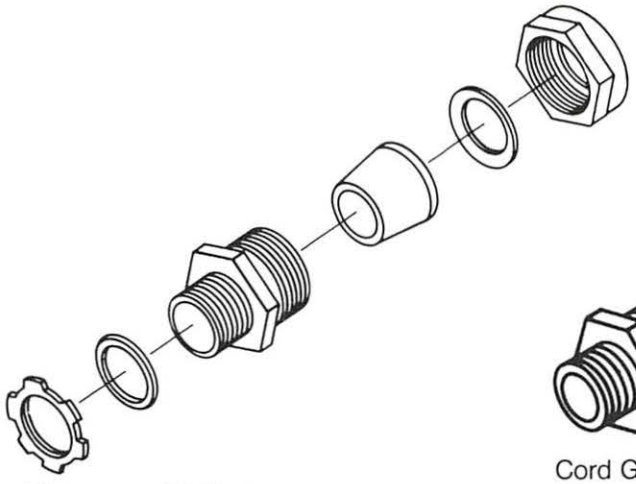
Ventilator is designed for 7/8 diameter mounting.

ORDERING INFORMATION

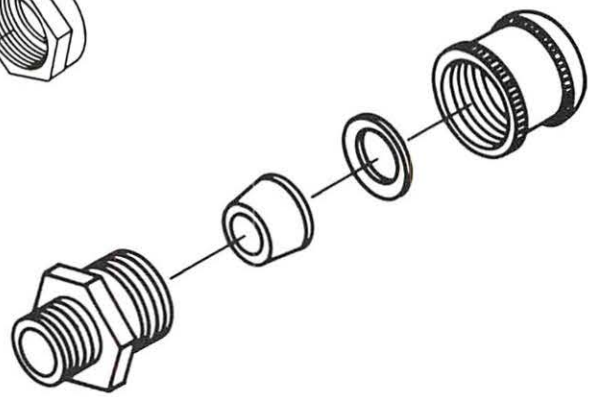
To Order: Specify Description and Part Number.

Item Number	Description	Inside Diameter In Inches	Part Number
1	Outlet	1-3/16	013001-9X
2	Outlet	1-3/8	013001-7X
3	Outlet	2	092494-23X
4	Outlet	2	092494-26X
5	Ventilator	——	091313-15X

WATER AND OIL TIGHT CORD CONNECTORS
CORD GRIP CONNECTORS



Water and Oil Tight
Cord Connectors



Cord Grip Connectors

Water tight and oil tight connectors are made of high quality malleable iron gland nut and body. The grommet is vinyl as is the outside sealing ring. A lock nut is included with the assembly. A flat washer between the gland nut and grommet assures even pressure and thus a dependable seal on the cable. The hub size indicates the N.P.T. mounting size.

Also available are single and double entry water tight and oil tight cord connectors for bond strand. These connectors have a 1-11½ N.P.T. mounting size.

Cord Grip Connectors are complete with aluminum body, plain type aluminum compression nut and single hole oil-resistant rubber grommet. The cord grip assembly is mounted through a drilled hole and secured via lock nut.

To Order: Specify Diameter Range of Cable in Inches and Part Number.

Hub Size	Diameter Range of Cable in Inches	Part Number
.500	.100-.200	7364
	.200-.300	7365
	.300-.400	7345
	.400-.500	7343
.750	.500-.600	7366
	.600-.700	7367
	.700-.800	7368
	.800-.900	7369
1.250	.900-1.000	7370
	1.000-1.200	7371
	1.200-1.400	7372
2.000	1.400-1.600	7373
	1.600-1.800	7374
2.500	1.800-2.100	7375
	2.100-2.400	7376
Single entrance connector for bond strand		091463-125
Double entrance connector for bond strand		091463-124

Conduit Size In Inches	Diameter Range of Cable In Inches	Part Number
.500	.125-.250	7377
	.250-.375	7378
	.375-.500	7379
	.500-.625	7380
.750	.625-.687	7381
	.687-.750	7382
1.000	.750-.875	7383
	.875-1.000	7384
	1.000-1.062	7385
	1.062-1.125	7386
	1.125-1.187	7387
	1.187-1.250	7388

Safetran

BATTERY WELLS

- GALVANIZED WITH ACID RESISTANT COATING
- WOODEN BOTTOM GRATING, SIDE LINING, AND FROST COVER
- CHAINS PROVIDED TO LOCK COVER

Steel Battery Wells are of heavy gauge galvanized steel construction. The well is of one piece, formed and seam welded.

The cover has a raised center which allows for efficient water drainage. It is completely removable and can be locked in place with chains provided on opposing sides of well.

To protect the cells from contacting the metal surfaces of the battery well, wooden side linings, and bottom grating are used. The inner removable frost cover is also constructed of wood.

The interior, as is the side lining, grating, and frost cover, are coated with acid resistant material. The battery wells are ventilated on two sides. An aerial cable inlet is furnished and knockouts are provided for location of inlet on two sides of the battery well.

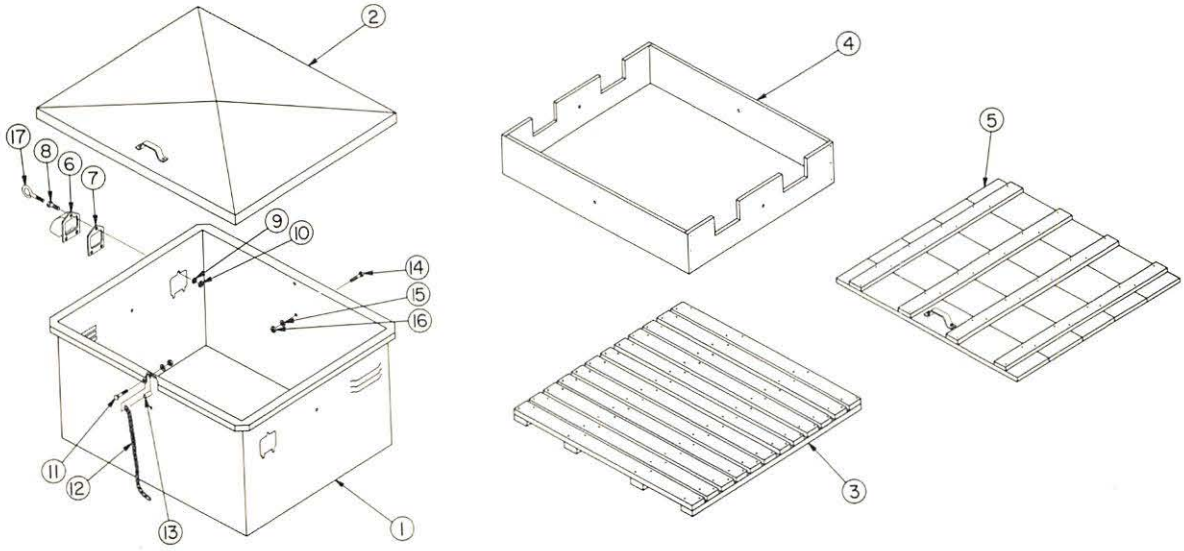
ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Dimensions in Inches			Part Number
	Height	Width	Depth	
Battery Well (for 1 to 10 cells)	18	27.75	27.75	131800-10X
Battery Well (for 11 to 16 cells)	18	33.75	33.75	131800-16X
Battery Well (for 17 to 20 cells)	18	41.75	34.75	131800-20X

Dimensions shown are inside dimensions with bottom grating, side lining, and frost cover in place.

ORDERING INFORMATION



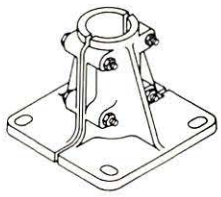
To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Wrap, Battery Well, 20 Cell	1	131801-500X
	Wrap, Battery Well, 16 Cell	1	131801-1X
	Wrap, Battery Well, 10 Cell	1	131801-X
2	Cover, 20 Cell	1	131804-500X
	Cover, 16 Cell	1	131804
	Cover, 10 Cell	1	131804-1
3	Grating, Bottom, 20 Cell	1	131807-500X
	Grating, Bottom, 16 Cell	1	131807
	Grating, Bottom, 10 Cell	1	131807-1
4	Lining, Side, 20 Cell	1	131808-500X
	Lining, Side, 16 Cell	1	131808
	Lining, Side, 10 Cell	1	131808-1
5	Cover, Frost, 20 Cell	1	131806-500X
	Cover, Frost, 16 Cell	1	131806
	Cover, Frost, 10 Cell	1	131806-1
6	Inlet, Aerial Cable	1	035035
7	Gasket	1	035022-1
8	Cap Screw, Hex Head, 3/8"-16 x 1"	3	4088-HSC
9	Washer, Spring Lock, M, 3/8"	3	1810-MSC
10	Nut, Hex, 3/8"-16	3	2104-SC
11	Bolt, Carriage, 5/16"-24 x 2.25"	2	6004-CO
12	Chain (specify length in feet)		100603
13	Support, Pipe	2	131809
14	Bolt, Carriage, 5/16"-24 x 2.25"	4	6001-CO
15	Washer, Flat, 5/16"	6	1752-C
16	Nut, Hex, 5/16"-24	6	2303-SC
17	Bolt, Eye (includes on hex nut)	1	7058

CABLE POST ASSEMBLIES

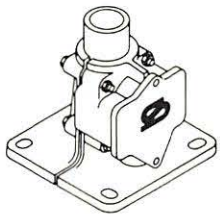
Safetran Cable Post Assemblies can be furnished with either 4 or 5 inch mast with bases of either the one piece, split, or junction box type. These assemblies are available with aluminum mast and cast iron base. The steel mast and cast iron base is painted with red oxide primer. Mounting bolt spacing for one piece base is 8-1/2 x 8-1/2 inches. Split and junction box type bases are available with mounting bolt spacings of either 9-1/2 x 9-1/2 inches or 11-11/16 x 11-11/16 inches.

Head and pinnacle assemblies are cast aluminum. The cable support clamps are fabricated from steel strap and are painted with red oxide primer.



Split Base

One Piece Base



Junction Box Base

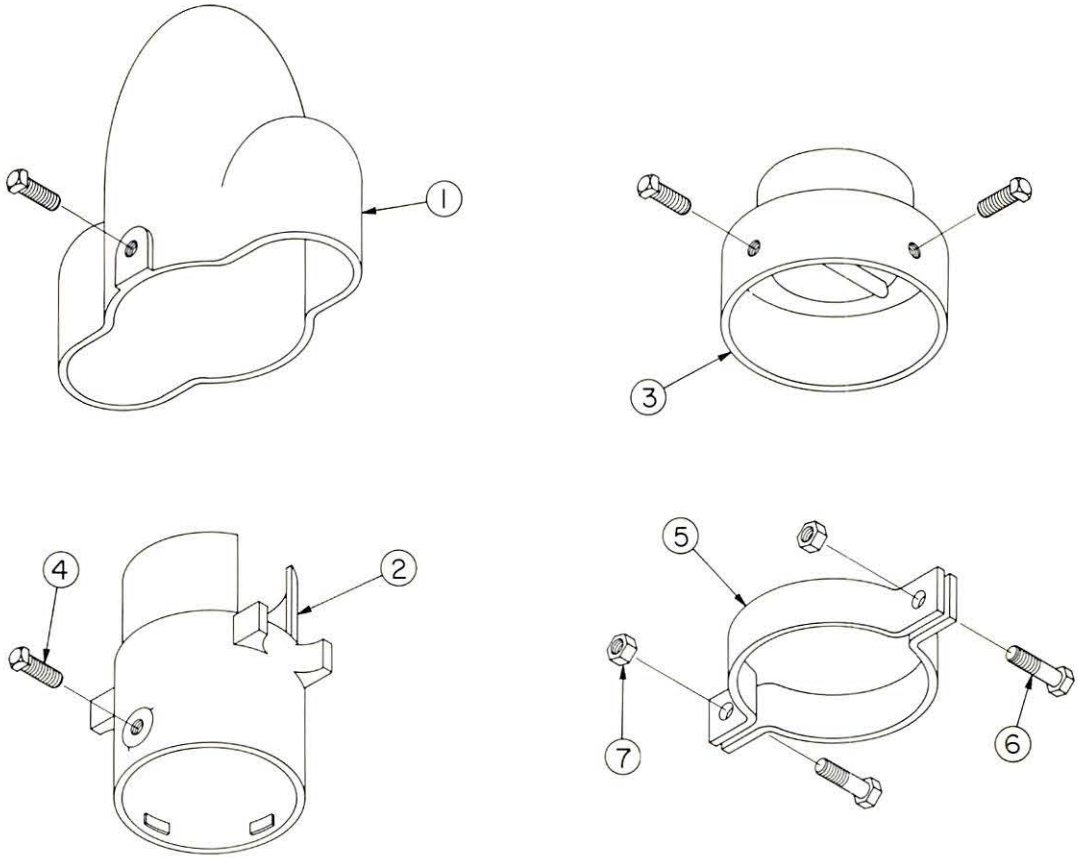
ORDERING INFORMATION

To Order: Specify Total Height of Assembly and Part Number.

Base Type	Mast Diameter In Inches	Bolt Spacing In Inches	Part Number	
			Steel	Aluminum
One Piece	4	8-1/2 x 8-1/2	035100-X	035100-AX
One Piece	5	8-1/2 x 8-1/2	035104-X	035104-AX
Split	4	9-1/2 x 9-1/2	035100-1X	035102-X
Split	4	11-11/16 x 11-11/16	035100-2X	035102-1X
Split	5	11-11/16 x 11-11/16	035105-X	035105-AX
Junction Box	4	9-1/2 x 9-1/2	035101-X	035103-X
Junction Box	4	11-11/16 x 11-11/16	035101-1X	035103-1X
Junction Box	5	11-11/16 x 11-11/16	035105-1X	035105-1AX

Additional information for bases used with these cable post assemblies may be found in Section A-9 of this catalog.

REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Pinnacle	050328
2	Head, Post	050329
3	Adapter, Pipe, 5″	040220-2
4	Set Screw, Square Head, 1/2″-13 x 1.25″	4962-SC
5	Clamp, Pipe, 5″	035015-1
6	Cap Screw, Hex Head, 1/2″-13 x 1.75″	4169-HSC
7	Nut, Hex, 1/2″-13	2108-SC

MAST ONLY

To Order: Specify length of Mast required and Part Number.

Base Type	Mast Diameter In Inches	Part Number	
		Steel	Aluminum
One Piece or Split	4	035100	035102
One Piece or Split	5	035104	035104-A
Junction Box	4	035101	035103
Junction Box	5	035105-1	035105-1A

Section F

Safetran

FOUNDATIONS

SECTION F

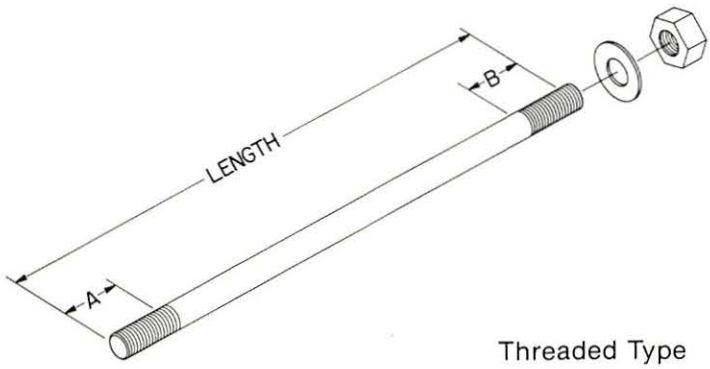
CONTENTS

Product	Subsection
Anchor Bolts	1
Signal Foundations	2
Structure Foundations	3

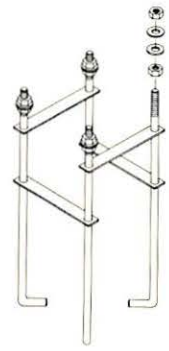
Safetran

ANCHOR BOLTS

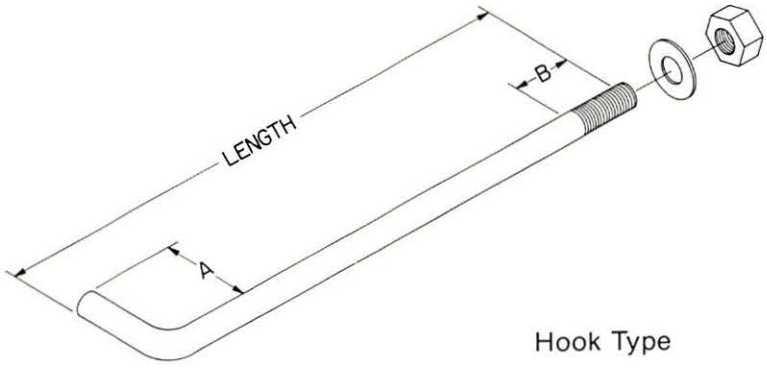
FOR FIELD POURED CONCRETE FOUNDATIONS



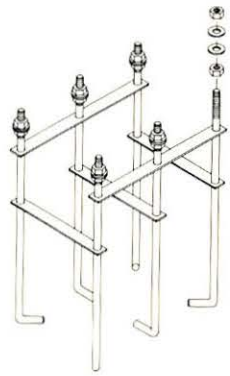
Threaded Type



Model W Cantilever Foundation



Hook Type



Model WNR Cantilever Foundation

Safetran Anchor Bolts are of steel construction, galvanized to help prevent corrosion. All assemblies listed include one galvanized steel wrought washer and hex nut unless otherwise noted.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

HOOK TYPE

Dimensions in Inches				Part Number
Length	Diameter	A	B	
9	3/4	4-1/4	3	131702-4X
9-1/2	3/4	4	3	131702-18X
12	1/2	4-1/4	3	131702-1X
12	3/4	4-1/4	3	131702-2X
12	1	4-1/4	3	131702-3X
16	3/4	4-3/8	3	131702-6X
16	1	4-3/8	3	131702-7X
18	3/4	4	3	131702-15X
20	1/2	4	1-1/2	131702-10X
24	3/4	4	3	131702-14X
24	1	5-3/8	3	131702-5X
36	1	4	2	131702-12X
36	1-1/4	4	2	131702-19X
42	1	4	2	131702-11X
42	1-1/4	4	2	131702-8X
*42	1-1/2	4	6-1/2	131700-100X
*48	1-1/2	6	6-1/2	131700-48X
*54	1-1/2	6	6-1/2	131700-96X
+54	1-1/2	6	6-1/2	131700-103X
++54	1-1/2	6	6-1/2	131700-108X
60	1	4	2	131702-16X
60	1	6	5-1/2	131702-13X
§60	1	6	5-1/2	131702-17X
74	1-1/4	6-3/8	3-1/2	131702-22X
74	1-1/4	6-3/8	8	131702-23X
87	1-1/4	4	2	131702-21X
§120	1	6	5-1/2	131702-20X

* Includes two galvanized steel wrought washers and hex nuts.

\+ Recommended Model W Cantilever Foundation. (Includes 4 Anchor Bolts, 8 wrought washers and hex nuts, and 4 spacer bars.)

++ Recommended Model WNR Cantilever Foundation. (Includes 6 Anchor Bolts, 12 wrought washers and hex nuts, and 5 spacer bars.)

§ Includes one stainless steel cut washer and hex nut.

THREADED TYPE

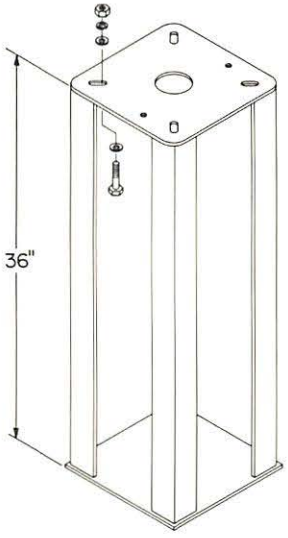
Dimensions in Inches				Part Number
Length	Diameter	A	B	
45-1/4	1	1	2-1/4	131702-503X
57-1/4	1	1	2-1/4	131702-502X
69-1/4	1	1	2-1/4	131702-500X
*70	1-1/4	6	6	131702-25X
81-1/4	1	1	2-1/4	131702-501X

* Includes three galvanized steel wrought washers and hex nuts.

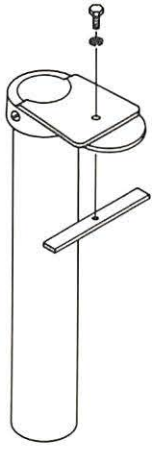
Safetran

SIGNAL FOUNDATIONS

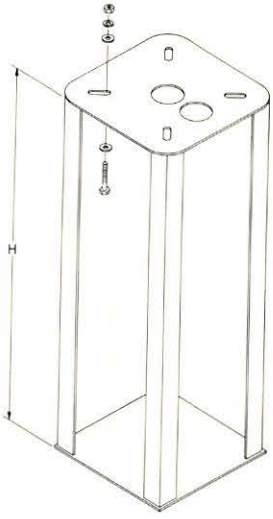
WAYSIDE, FLASHING LIGHT, CROSSING GATE



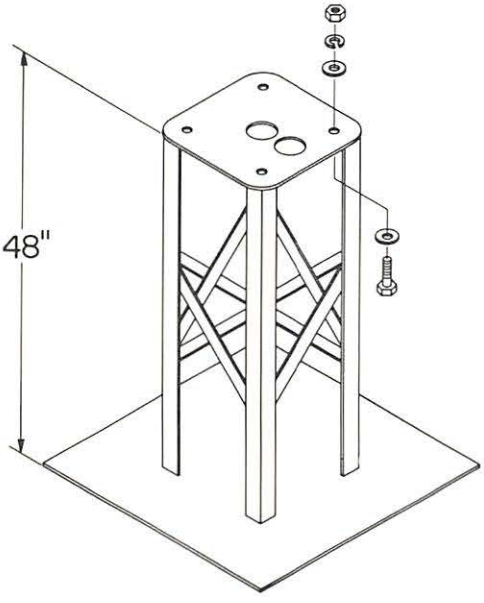
Wayside



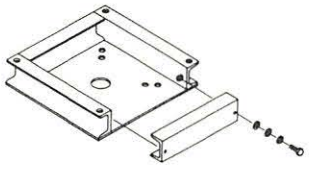
Cable Riser Assembly



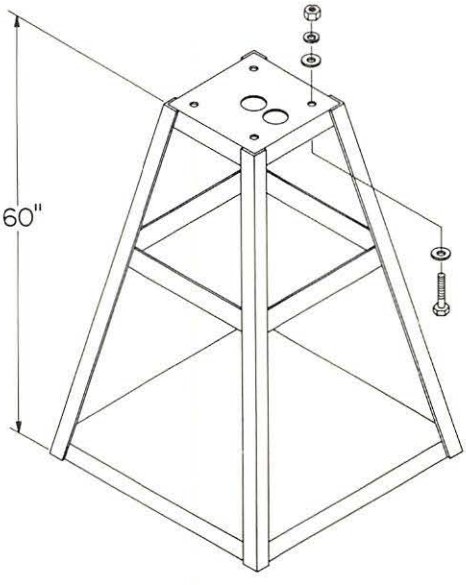
Flashing Light



Crossing Gate (Square Type)



Adapter Plate



Crossing Gate (Pyramid Type)

ORDERING INFORMATION

WAYSIDE SIGNAL FOUNDATION

The Wayside Signal Foundation is constructed of 2-1/2 x 2-1/2 x 1/4 inch steel angle and 1/4 inch steel plate welded together and is galvanize finished. Mounting bolt size is 3/4"-10 with a 2-3/4 inch projection. This 36 inch high foundation will accommodate 6 x 8, and 6-3/4 x 6-3/4 inch bolt spacings.

To Order: Specify Wayside Signal Foundation, and Part Number 035800-900X

FLASHING LIGHT SIGNAL FOUNDATIONS

The Flashing Light Signal Foundations are constructed of 2-1/2 x 2-1/2 x 1/4 inch steel angle and 1/4 inch steel plate welded together and are galvanize finished.

Mounting bolt size 3/4"-10 with a 2-3/4 inch projection. These foundations will accommodate both 9-1/2 x 9-1/2 and 11-11/16 x 11-11/16 inch bolt spacings. Also, they are equipped with cable riser assemblies which provide a protective wire chase to either the split or junction box type base.

To Order: Specify Description, Height (H), and Part Number

Description	Height (H) in Inches	Part Number
Flashing Light Signal Foundation	48	035903-911X
Flashing Light Signal Foundation	60	035903-9113X

CROSSING GATE FOUNDATIONS

Safetran Crossing Gate Foundations are constructed of steel angle and plate welded together and are galvanize finished. The Square Type is constructed of 2-1/2 x 2-1/2 x 1/4 inch steel angle and 1/4 inch steel plate. Mounting bolt size is 1"-8 with a 3-1/4 inch projection. The Pyramid Type is constructed of 3 x 3 x 3/8 inch steel angle and 3/16 inch steel plate. Mounting bolt size is 1"-8 with a 5-1/4 inch projection.

These foundations are designed for 11-11/16 x 11-11/16 inch bolt spacings; however, an adapter plate may be used to accommodate 19 x 19 inch bolt spacings.

Both foundations are equipped with cable riser assemblies which provide a protective wire chase to either the split or junction box type base.

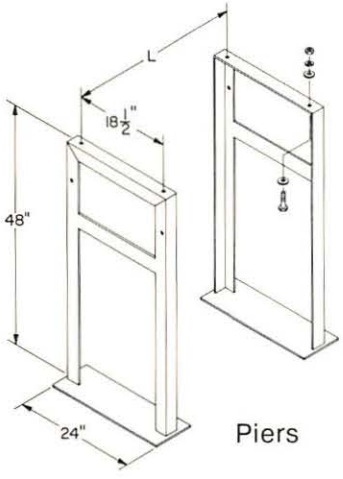
To Order: Specify Description and Part Number.

Description	Part Number
Crossing Gate Foundation (Square Type)	035903-9111X
Crossing Gate Foundation (Pyramid Type)	035903-500X
Adapter Plate	035832-1X

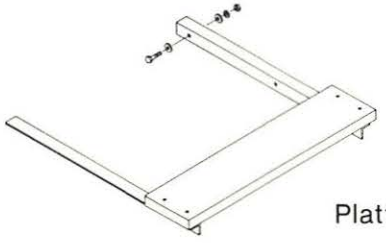
Safetran

STRUCTURE FOUNDATIONS

TELEPHONE BOOTH, INSTRUMENT HOUSE, INSTRUMENT CASE

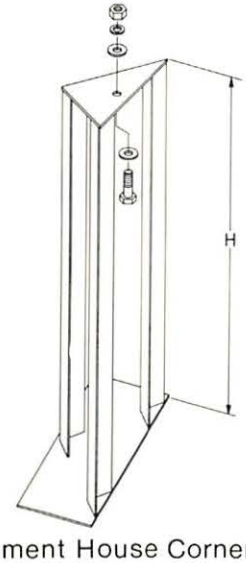


Piers

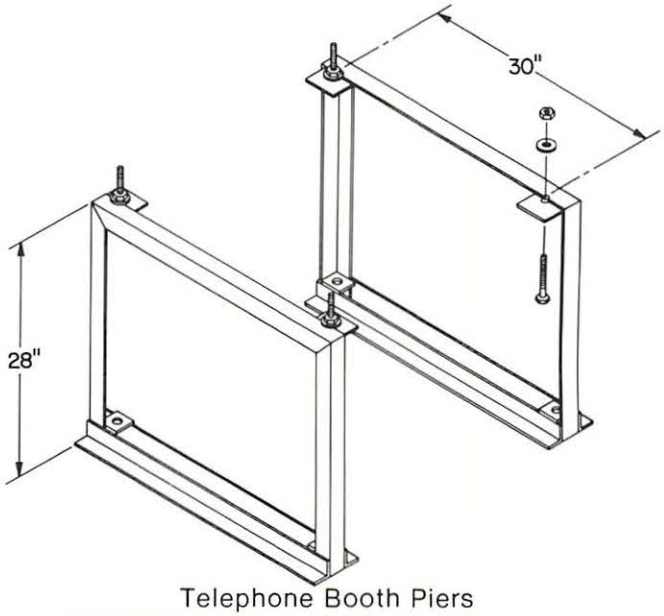


Platforms

Instrument Case



Instrument House Corner Pier



Telephone Booth Piers

ORDERING INFORMATION
TELEPHONE BOOTH FOUNDATION

Telephone Booth Foundations are constructed of 2 x 2 x 1/4 inch steel angle and 1/4 inch steel plate welded together and are galvanize finished. The holes at the bottom of the foundation allow for stacking when required. Mounting bolt size is 1/2"-13 with a 3-3/4 inch projection.

To Order: Specify Telephone Booth Foundation, and Part Number 051312-1X.

INSTRUMENT HOUSE FOUNDATION

Instrument House Foundations are constructed of 2-1/2 x 2-1/2 x 1/4 inch steel angle and 1/4 inch steel plate welded together and are galvanize finished. Mounting bolt size is 3/4"-10 with a 1-3/4 inch projection.

To Order: Specify Description, Height (H), and Part Number.

Description	Height (H) in Inches	Part Number
Instrument House Foundation	30	035800-2BX
Instrument House Foundation	48	035800-2X
Instrument House Foundation	96	035800-4X

INSTRUMENT CASE FOUNDATION

Instrument Case Foundations are constructed of 2-1/2 x 2-1/2 x 1/4 inch steel angle and 1/4 inch steel plate welded together and are galvanize finished. Mounting bolt size is 3/4"-10 with a 1-1/2 inch projection. Platforms for these foundations are 9-1/2 inches wide, available in either wood or expanded metal, and are furnished with appropriate mounting hardware.

To Order: Specify Instrument Case Foundation, Length (L), and Part Number.

Length (L) in Inches	Part Number				
	Foundation Only	Foundation with 1 Wood Platform	Foundation with 2 Wood Platforms	Foundation with 1 Metal Platform	Foundation with 2 Metal Platforms
34	035900-X	035900-1WX	035900-1PX	035900-1MX	035900-1RX
40-3/4	035900-X	035900-6WX	035900-6PX	035900-6MX	035900-6RX
43-3/4	035900-X	035900-2WX	035900-2PX	035900-2MX	035900-2RX
61-1/4	035900-X	035900-3WX	035900-3PX	035900-3MX	035900-3RX
83-1/4	035900-X	035900-4WX	035900-4PX	035900-4MX	035900-4RX
118-1/4	035900-X	035900-5WX	035900-5PX	035900-5MX	035900-5RX

Section G

POWER SUPPLIES

SECTION G

CONTENTS

Product	Subsection
Battery Regulators	1
Transformers	2
Converters	3
Inverters	4
Battery Accessories	5

EDISON Ni CAD BATTERIES

TABLE IV
PHYSICAL CHARACTERISTICS

	Width (inches)	*Height (inches)*	*Length (inches)*	*Weight** (± 1 lb.)*
TYPE ED-80				
1-cell	6 3/8	12 1/4	3 3/8	13 lbs.
2-cell	6 3/8	12 1/4	6 1/2	26 lbs.
3-cell	6 3/8	12 1/4	9 9/16	38 lbs.
4-cell	6 3/8	12 1/4	12 11/16	50 lbs.
5-cell	6 3/8	12 1/4	15 11/16	63 lbs.
TYPE ED-120				
1-cell	6 3/8	12 1/4	4 11/16	19 lbs.
2-cell	6 3/8	12 1/4	9	36 lbs.
3-cell	6 3/8	12 1/4	13 9/16	53 lbs.
4-cell	6 3/8	12 1/4	17 11/16	70 lbs.
5-cell	6 3/8	12 1/4	22 1/16	88 lbs.
TYPE ED-160				
1-cell	6 3/8	18 1/4	3 3/8	21 lbs.
2-cell	6 3/8	18 1/4	6 1/2	41 lbs.
3-cell	6 3/8	18 1/4	9 9/16	61 lbs.
4-cell	6 3/8	18 1/4	12 11/16	81 lbs.
5-cell	6 3/8	18 1/4	15 11/16	101 lbs.
TYPE ED-240				
1-cell	6 3/8	18 1/4	4 11/16	30 lbs.
2-cell	6 3/8	18 1/4	9	60 lbs.
3-cell	6 3/8	18 1/4	13 9/16	88 lbs.
4-cell	6 3/8	18 1/4	17 11/16	117 lbs.
5-cell	6 3/8	18 1/4	22 1/16	146 lbs.
TYPE ED-340				
1-cell	6 3/8	18 1/4	6 3/4	44 lbs.
2-cell	6 3/8	18 1/4	13 3/8	86 lbs.
3-cell	6 3/8	18 1/4	19 7/8	128 lbs.
*4-cell	6 3/8	18 1/4	26 3/8	170 lbs.
TYPE ED-400				
1-cell	6 3/8	18 1/4	6 3/4	46 lbs.
2-cell	6 3/8	18 1/4	13 3/8	90 lbs.
3-cell	6 3/8	18 1/4	19 7/8	134 lbs.
*4-cell	6 3/8	18 1/4	26 3/8	178 lbs.

Multi-cell assemblies beyond five cells may be ordered as required.

*For Types ED-340 and ED-400 it is not recommended that multi-cell assemblies beyond four cells be ordered.

**Including Handles, Cliplocks, Terminal Lugs and Intercell Connectors.

ORDERING REFERENCES

Use type number reference given above on all orders. Specify (1) type of cell, (2) type or types of multi-cell assemblies required (i.e., 5-cell assembly, 7-cell assembly, etc.); and (3) quantity of each multi-cell assembly required.

All orders should be addressed to: McGRAW-EDISON COMPANY, EDISON BATTERY DIVISION, P.O. BOX 28, BLOOMFIELD, NEW JERSEY 07003

TABLE I
CELL PERFORMANCE DATA

CURRENT IN AMPERES TO 1.14 VOLTS PER CELL (@ 77° F.)

Discharge Period

Cell Type	*Hours*			*Minutes*				
	8	*5*	*3*	*60*	*30*	*15*	*5*	*1*
ED-80	10	15.3	22.7	43	53	61	74	92
ED-120	15	22.3	35	66	81	92	113	138
ED-160	20	29.3	44	69	83	96	118	144
ED-240	30	44	66	110	132	152	184	222
ED-340	42.5	64	90	155	187	215	258	306
ED-400	50	74	105	178	214	247	298	360

TABLE II
CELL PERFORMANCE DATA

CURRENT IN AMPERES TO 1.10 VOLTS PER CELL (@ 77° F.)

Discharge Period

Cell Type	*Hours*			*Minutes*				
	8	*5*	*3*	*60*	*30*	*15*	*5*	*1*
ED-80	10.4	16	24.8	48	66	76	90	110
ED-120	15.7	24	38.2	81	99	115	134	164
ED-160	21	32	48.8	90	105	118	144	180
ED-240	31.5	48	72	128	152	178	220	274
ED-340	44.2	68	102	180	214	250	308	384
ED-400	52.3	80	119	211	251	294	352	445

TABLE III
CELL PERFORMANCE DATA

CURRENT IN AMPERES TO 1.00 VOLTS PER CELL (@ 77° F.)

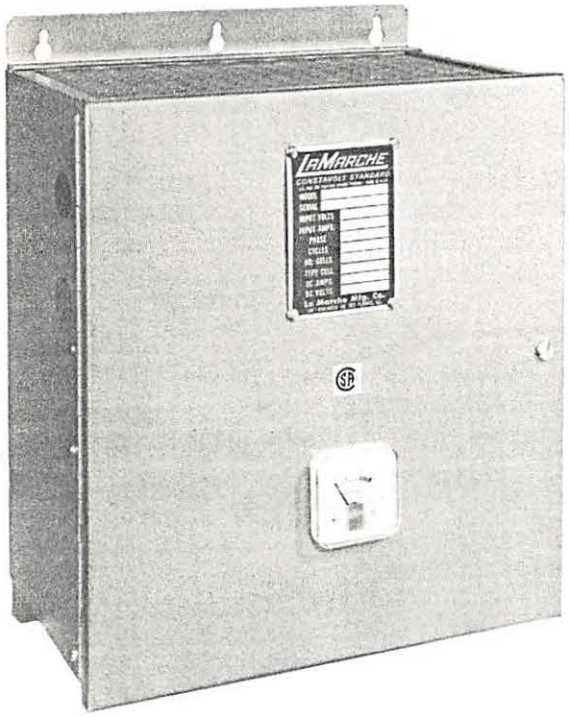
Discharge Period

Cell Type	*Hours*			*Minutes*				
	8	*5*	*3*	*60*	*30*	*15*	*5*	*1*
ED-80	10.7	16.6	25.6	58	90	111	118	141
ED-120	16.1	25.2	39.5	91	140	169	178	212
ED-160	21.4	33.6	50.4	112	153	177	196	233
ED-240	32	51	74	165	230	273	321	369
ED-340	44.8	70.2	104	232	324	384	454	520
ED-400	52.7	83	122	272	384	450	534	610

Model A40

FOR FLOAT SERVICE WHERE THE LOAD REQUIREMENTS ARE CONTINUOUS OR INTERMITTENT, THE BATTERIES ARE EXERCISED FREQUENTLY OR THE CHARGER MUST BE CAPABLE OF CONTINUOUS OUTPUT UP TO 80% OF MAXIMUM RATING.

MANUFACTURERS AND ORIGINATORS OF THE WORLD'S MOST COMPLETE LINE OF BATTERY CHARGERS



GENERAL DESCRIPTION

The Model A40 Battery Charger is a completely automatic, solid state, constant voltage device having:

A.C. VOLTAGE COMPENSATION
D.C. VOLTAGE REGULATION
CURRENT LIMITING

The model (A40) charger is built to carry continuous and intermittent loads up to 80% of maximum rated output. The A40 is current limited at 120% of rated output. Each unit is designed and built to charge lead acid, nickel cad or nickel iron batteries containing a specific number of cells.

The model A40 is designed for engine starting and all float applications where the battery is exercised frequently eliminating the need for battery equalization. There are no controls to be set for different applications because the amount of loading and the state of charge of the battery determine the chargers current output. Shut-down to a very low trickle charge once the battery becomes fully charged, is automatic.

The model A40 charger lends itself to applications where it is advantageous to have the charger permanently connected across the battery keeping it fully charged at all times and to simultaneously carry continuous or intermittent current loads.

The La Marche transistor controlled magnetic amplifier circuits provide continuous taper charging. Maintains rated D.C. output voltage with A.C. input variations of ±10%. Silicon diodes are used for rectification.

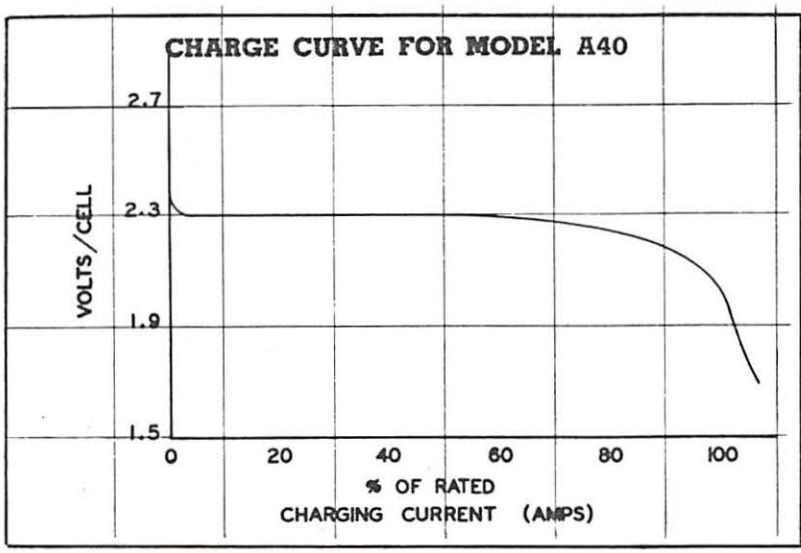
Guide 360-E-O Rectifiers

LR14209

DESIGN FEATURES

1. Automatic in operation and self-regulating.
2. Cannot discharge battery if A.C. line goes off.
3. Ammeter to tell rate of charge.
4. No external controls. Cannot be tampered with.
5. Quality parts throughout. Silicon diode rectifiers and transistor magnetic amplifiers used exclusively. No aging adjustments.
6. Fused input-output are standard on all models.
7. Complete isolation of the A.C. line from the D.C. charging circuit eliminates the problem of fuse blowing on grounded equipment.

Printed in U.S.A.



WHEN ORDERING PLEASE SPECIFY:

1. LaMarche model number A40
2. A.C. input voltage, cycles, phase
3. Number and type of battery cells
4. Ampere hour capacity of battery
5. Intermittent D.C. loads and duration
6. Continuous D.C. load
7. Allowable recharging time from full discharge where applicable

GENERAL INFORMATION

ELECTRICAL:

A.C. INPUT VOLTAGES:

120, 208 or 240 single phase, 50/60 cycles, 208 or 240 three phase, model marked * are available in three phase as standard, 50/60 cycles

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† BATTERY TYPES: The model A40 chargers are available in the above listed ampere capacities and **nominal D.C. voltages** for lead-acid, nickel-cadmium, nickel-iron alkaline and other types of batteries. **Specify number and type of battery cells.**

MECHANICAL:

Overall dimensions and approximate shipping weights are listed. Case specifications are subject to change and where space requirements are critical it is best to check the plant for latest dimensions.

FINISH: Base material pretreated with zinc phosphate. Grey primer covering all base metal. Hammertone grey baked enamel finish coat.

MOUNTING: Mounting flanges are supplied as part of the cabinet back plate on wall mounted units.

OPTIONAL ACCESSORY:

Export packing

SAMPLE SPECIFICATIONS FOR MODEL A40

The charger to be furnished shall be the LaMarche Mfg. Co. Model A40, or approved equal, and shall utilize a modified constant-voltage load-carrying output curve which varies from 2.0 VPC at full load to 2.33 VPC on unloaded fully-charged lead-acid cells. This charger shall maintain this curve with line variations of ± 10%. This charger shall have:

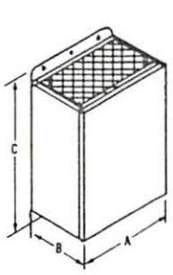
a. Automatic A.C. line compensation.
b. Automatic overload protection (current limiting).
c. Hermetically sealed silicone diode full-wave rectifiers.
d. Automatic surge suppressors.
e. Automatic load regulation.
f. D.C. output ammeter.
g. Fused A.C. input and D.C. output.
h. Automatic D.C. voltage regulation.

LA MARCHE MODEL NO.	D.C. Output Amps.	D.C. Output System Voltage	Case No.‡	Approx. Weight
12 VOLT SYSTEMS†				
A40- 10- 12V✦	10	12	05	42
A40- 20- 12V✦	20	12	2	59
A40- 30- 12V✦	30	12	2	63
A40- 40- 12V✦	40	12	2	74
A40- 60- 12V✦	60	12	7	92
A40- 75- 12V	75	12	3	120
A40-100- 12V	100	12	6	150
A40-125- 12V*	125	12	8	225
A40-150- 12V*	150	12	8	250
A40-200- 12V*	200	12	8•	275
24 VOLT SYSTEMS†				
A40- 10- 24V✦	10	24	2	48
A40- 20- 24V✦	20	24	2	63
A40- 30- 24V✦	30	24	7	66
A40- 40- 40V✦	40	24	7	78
A40- 60- 24V✦	60	24	3	98
A40- 75- 24V	75	24	3•	135
A40-100- 24V*	100	24	8	215
A40-125- 24V*	125	24	8•	238
A40-150- 24V*	150	24	8•	337
A40-200- 24V*	200	24	16	390
36 VOLT SYSTEMS†				
A40- 10- 36V✦	10	36	2	51
A40- 20- 36V✦	20	36	7	59
A40- 30- 36V✦	30	36	7	62
A40- 40- 36V✦	40	36	3	68
A40- 60- 36V✦	60	36	6	83
A40- 75- 36V	75	36	6	192
A40- 100- 36V*	100	36	15	331
A40- 125- 36V*	125	36	16	345
A40- 150- 36V*	150	36	16	450
A40-200- 36V*	200	36	16	490

LA MARCHE MODEL NO.	D.C. Output Amps.	D.C. Output System Voltage	Case No.‡	Approx. Weight
48 VOLT SYSTEMS†				
A40- 10- 48V✦	10	48	2	61
A40- 20- 48V✦	20	48	7	90
A40- 30- 48V✦	30	48	3	109
A40- 40- 48V✦	40	48	3	147
A40- 60- 48V*	60	48	8•	312
A40- 75- 48V*	75	48	15	335
A40-100- 48V*	100	48	16	375
A40-125- 48V*	125	48	16	450
A40-150- 48V*	150	48	16	490
A40-200- 48V*	200	48	16	520
130 VOLT SYSTEMS†				
A40- 10-130V✦	10	130	6	103
A40- 20-130V✦	20	130	6	130
A40- 30-130V✦	30	130	8	175
A40- 40-130V*	40	130	15	205
A40- 60-130V*	60	130	16	325
A40- 75-130V*	75	130	27	358
A40-100-130V*	100	130	27	390
A40-125-130V*	125	130	27	435
260 VOLT SYSTEMS†				
A40- 10-260V	10	260	6	165
A40- 20-260V*	20	260	16	250
A40- 30-260V*	30	260	16	327
A40- 40-260V*	40	260	27	375
A40- 60-260V*	60	260	27	405

NOTES:

Units above are Underwriters Listed
480 VAC and less 1Ø, 550 VAC and less 3Ø
• Denotes Change or Addition
* Denotes 3Ø
✦ CSA Listed 120 VAC or 240 VAC 1Ø input units



CASE DIMENSIONS

case no.	A	B	C	mounting
05	8	7	13	Wall
2	12 13/16	10	17 1/8	Wall
3	15 3/8	11	23 5/16	Wall
6	25	11 9/16	27 1/2	Floor/Wall
7	14 1/4	10 5/8	19 3/16	Wall
8	27 1/4	15 1/2	32 1/2	Floor/Wall
15	27	27 5/8	28	Floor
16	27	26 1/8	44 1/2	Floor
27	27 5/16	25 7/8	56 1/8	Floor

CASE NO.	A	B	C
05	13"	8"	7"
1	16¼"	10⅜"	7⅞"
2	17⅛"	12¾"	10"
3	23¾"	15⅜"	11"
6	27½"	25"	11⅝"
7	19⅞"	14¼"	10⅝"
40	13"	14⅞"	9"
41	14"	24"	12"

3. Number and Type of Battery Cells
4. Ampere Hour Capacity of Battery
5. Intermittent D.C. Loads and Duration
6. Continuous D.C. Load
7. Allowable Recharging Time from Full Discharge where Applicable
8. Please Specify Case Number

LaMARCHE®
106 Bradrock Drive Des Plaines, Illinois U.S.A. 60018
Phone 312/299-1188 Telex: 282526 Cable: LaMarche

LAMC2110 7/87 10M
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A40- 75- 12V	75	12	3	120
A40-100- 12V	100	12	6	150
A40-125- 12V*	125	12	8	225
A40-150- 12V*	150	12	8	250
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24 VOLT SYSTEMS†				
A40- 10- 24V✦	10	24	2	48
A40- 20- 24V✦	20	24	2	63
A40- 30- 24V✦	30	24	7	66
A40- 40- 40V✦	40	24	7	78
A40- 60- 24V✦	60	24	3	98
A40- 75- 24V	75	24	3•	135
A40-100- 24V*	100	24	8	215
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A40- 30- 48V✦	30	48	3	109
A40- 40- 48V✦	40	48	3	147
A40- 60- 48V*	60	48	8•	312
A40- 75- 48V*	75	48	15	335
A40-100- 48V*	100	48	16	375
A40-125- 48V*	125	48	16	450
A40-150- 48V*	150	48	16	490
A40-200- 48V*	200	48	16	520
130 VOLT SYSTEMS†				
A40- 10-130V✦	10	130	6	103
A40- 20-130V✦	20	130	6	130
A40- 30-130V✦	30	130	8	175
A40- 40-130V*	40	130	15	205
A40- 60-130V*	60	130	16	325
A40- 75-130V*	75	130	27	358
A40-100-130V*	100	130	27	390
A40-125-130V*	125	130	27	435
260 VOLT SYSTEMS†				
A40- 10-260V	10	260	6	165
A40- 20-260V*	20	260	16	250
A40- 30-260V*	30	260	16	327
A40- 40-260V*	40	260	27	375
A40- 60-260V*	60	260	27	405

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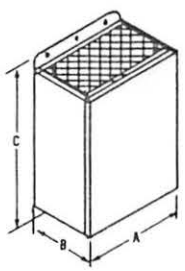
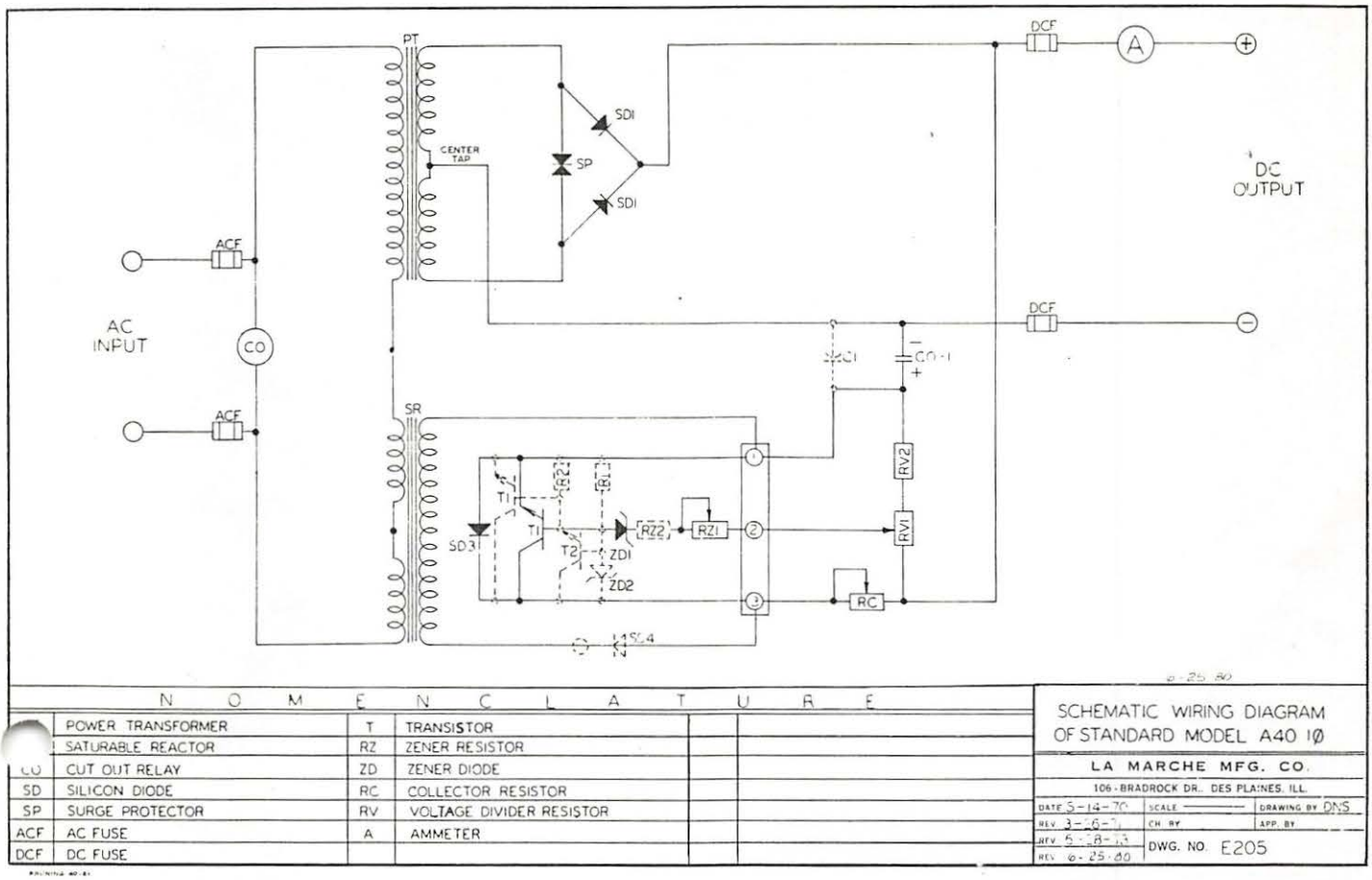
* Denotes 3Ø
✦ CSA Listed 120 VAC or 240 VAC 1Ø input units



CASE DIMENSIONS

case no.	A	B	C	mounting
05	8	7	13	Wall
2	12 13/16	10	17 1/8	Wall
3	15 3/8	11	23 1/16	Wall
6	25	11 9/16	27 1/2	Floor/Wall
7	14 1/4	10 5/8	19 3/16	Wall
8	27 1/4	15 1/2	32 1/2	Floor/Wall
15	27	27 3/8	28	Floor
16	27	26 1/8	44 1/2	Floor
27	27 5/16	25 7/8	56 1/8	Floor



N O M E N C L A T U R E					
	POWER TRANSFORMER	T	TRANSISTOR		
	SATURABLE REACTOR	RZ	ZENER RESISTOR		
CO	CUT OUT RELAY	ZD	ZENER DIODE		
SD	SILICON DIODE	RC	COLLECTOR RESISTOR		
SP	SURGE PROTECTOR	RV	VOLTAGE DIVIDER RESISTOR		
ACF	AC FUSE	A	AMMETER		
DCF	DC FUSE				

SCHEMATIC WIRING DIAGRAM OF STANDARD MODEL A40 1Ø

LA MARCHE MFG. CO.
106 - BRADROCK DR., DES PLAINES, ILL.

DATE 5-14-70 | SCALE ——— | DRAWING BY DNS
REV. 3-26-71 | CH. BY | APP. BY
REV. 5-28-73 | DWG. NO. E205
REV. 6-25-80

TYPICAL SCHEMATIC FOR MODEL A 40 CHARGER

MANUFACTURERS AND ORIGINATORS OF THE WORLD'S MOST COMPLETE LINE OF MAG-AMP. REGULATED AUTOMATIC BATTERY CHARGERS

LaMarche® Manufacturing Company

106 Bradrock Drive, Des Plains, Illinois U.S.A. 60018
Phone: 312/299-1188 Telex: 282526 Cable: LaMarche

REG 7/F IER

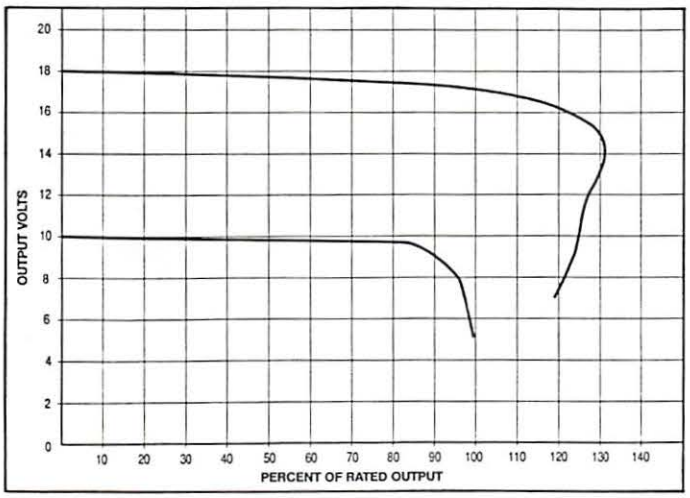
R SERIES ELECTRICAL SPECIFICATIONS

MODEL #	D.C. AMPS	D.C. VOLTS	A.C. INPUT VOLTAGE (60 to 100 Hz)	CASE # (specify)	WEIGHT
A40R - 10 - 10/18V	10	ADJ. (10-18V)	120 OR 208 OR 240	1 or 40	32
A40R - 20 - 10/18V	20	ADJ. (10-18V)	120 OR 208 OR 240	2 or 40	52
A40R - 30 - 10/18V	30	ADJ. (10-18V)	120 OR 208 OR 240	7 or 41	70
A40R - 40 - 10/18V	40	ADJ. (10-18V)	120 OR 208 OR 240	7 or 41	82
A40R - 10 - 17/32V	10	ADJ. (17-32V)	120 OR 208 OR 240	7 or 41	75
A40R - 20 - 17/32V	20	ADJ. (17-32V)	120 OR 208 OR 240	3 or 41	80
A40R - 30 - 17/32V	30	ADJ. (17-32V)	120 OR 208 OR 240	6	105
A40R - 40 - 17/32V	40	ADJ. (17-32V)	120 OR 208 OR 240	6	135
A40R1- 10 - 10/18V	10	ADJ. (10-18V)	120 OR 208 OR 240	2 or 40	52
A40R1- 20 - 10/18V	20	ADJ. (10-18V)	120 OR 208 OR 240	7 or 41	74
A40R1- 30 - 10/18V	30	ADJ. (10-18V)	120 OR 208 OR 240	7 or 41	82
A40R1- 40 - 10/18V	40	ADJ. (10-18V)	120 OR 208 OR 240	7 or 41	94
A40R2- 10 - 10/18V	10	ADJ. (10-18V)	120 OR 208 OR 240	2 or 40	53
A40R2- 20 - 10/18V	20	ADJ. (10-18V)	120 OR 208 OR 240	7 or 41	75
A40R2- 30 - 10/18V	30	ADJ. (10-18V)	120 OR 208 OR 240	3 or 41	83
A40R2- 40 - 10/18V	40	ADJ. (10-18V)	120 OR 208 OR 240	3 or 41	95

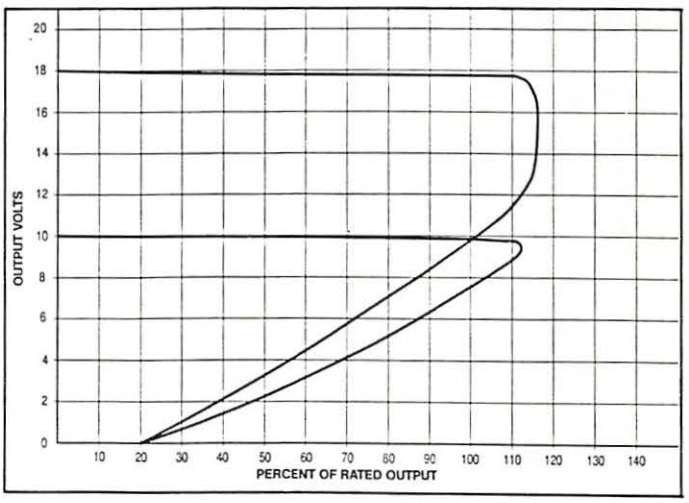
A40R SERIES PERFORMANCE SPECIFICATIONS

MODEL	D.C. OUTPUT RANGE	D.C. OUTPUT REG.	A.C. INPUT VOLTAGE	A.C. INPUT RANGE	TEMP. RANGE	OUTPUT CURRENT LIMIT	D.C. OUTPUT RIPPLE (RMS)		POWER FAILURE CIRCUIT	FUSED INPUT/ OUTPUT	AAR STYLE HARDWARE
							w/ Battery	w/o Battery			
A40R	10-18V 17-32V	TAPER CURVE −5%	120 or 208 or 240	± 10%	0-50 C	120%	N/A	N/A	YES	YES	YES
A40R1	10-18V	± 1%	"	± 20%	0-50 C	110% TO A SHORT	500MV	2.8V	YES	YES	YES
A40R2	10-18V	± 2%	"	± 20%	0-50 C	110% TO A SHORT	50MV	.7V	YES	YES	YES

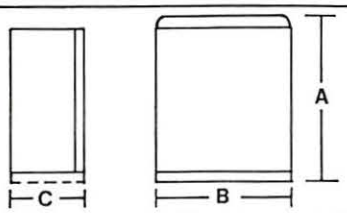
A40R SERIES TYPICAL OUTPUT CURVES



A40R1 & A40R2 SERIES TYPICAL OUTPUT CURVES



A40R SERIES CASE DIMENSIONS



CASE NO.	A	B	C
05	13"	8"	7"
1	16¼"	10⅜"	7⅞"
2	17⅛"	12¾"	10"
3	23¾"	15⅜"	11"
6	27½"	25"	11⅝"
7	19⅞"	14¼"	10⅝"
40	13"	14⅞"	9"
41	14"	24"	12"

ORDERING INFORMATION:

When ordering please specify:

1. La Marche Model Number A40R, A40R1, A40R2
2. Input Voltage, Cycles, Phase
3. Number and Type of Battery Cells
4. Ampere Hour Capacity of Battery
5. Intermittent D.C. Loads and Duration
6. Continuous D.C. Load
7. Allowable Recharging Time from Full Discharge where Applicable
8. Please Specify Case Number

LaMARCHE®

106 Bradrock Drive Des Plaines, Illinois U.S.A. 60018
Phone 312/299-1188 Telex: 282526 Cable: LaMarche

LAMC2110 7/87 10M

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Safetran

FERRO-RESONANT BATTERY CHARGERS

MODELS FR 20-B-10 AND FR 20-B-20

- **115 OR 230 VAC, 60 HZ OPERATION**
- **PROVIDES ALMOST CONSTANT PRE-DETERMINED VOLTAGE OUTPUT**
- **SELF-REGULATED OUTPUT VOLTAGE**
- **BATTERY IS MAINTAINED NEAR FULL CAPACITY LEVEL**

Safetran's Models FR 20-B-10 and FR 20-B-20 are automatic taper battery chargers for lead acid and nickel cadmium batteries requiring up to 21 volts float voltage. The rated output of the FR 20-B-10 at all voltages is 10 amperes. The FR 20-B-20 has a rated output of 20 amperes at all voltages. They have been designed for 115 or 230 VAC, 60 Hz operation.

The FR 20-B-10 and FR 20-B-20 provide an almost constant pre-determined voltage output, even with varying loads, after being adjusted to the proper battery/cell setting. This provides for rapid recovery after power outage without subsequent overcharging. Under conditions of varying load, the charger will assume most of the load, "floating" the battery and keeping it near maximum charge at all times.

The fixed ferro-resonant input transformer utilizes an additional winding which is resonated with a capacitor. This provides a self-regulated output voltage over a wide range of line voltage and output load. A multiple-tap secondary allows for adjustment of this constant voltage to match the battery/cell arrangement in use.

This regulation of the load voltage, or "floating" the battery, maintains the battery near full capacity and minimizes overcharging. Consequently, battery life is extended and water consumption is minimized.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
FR 20-B-10 Ferro-Resonant Battery Charger	010040-13X
FR 20-B-20 Ferro-Resonant Battery Charger	010040-24X

SPECIFICATIONS

	MODEL FR 20-B-20	MODEL FR 20-B-10
Input:	115/230 VAC nominal, 60 Hz ± 2 Hz	115/230 VAC nominal, 60 Hz ± 2 Hz
Output:	0 to 21 VDC (± 1 Volt), 20 Amperes	0 to 21 VDC (± 1 Volt), 10 Amperes
Ripple:	3 Vpp @ 10 Amperes, 7 Vpp @ 20 Amperes	1 Vpp @ 5 Amperes, 5 Vpp at 10 Amperes
Load Regulation:	2.4% for 30% to 100% load variation	5.3% for 30% to 100% load variation
Line Regulation:	Less than ± 1% at 10% input voltage variation	Less than ± 1% at 10% input voltage variation
Ambient Temperature:	-40 degrees F to + 170 degrees F (-40 degrees C to + 77 degrees C)	-40 degrees F to + 170 degrees F (-40 degrees C to + 77 degrees C)
Overload Current Limit:	28 to 32 Amperes depending on line voltage. Lower line voltage will result in lower current limit point.	11 to 16 Amperes depending on line voltage. Lower line voltage will result in lower current point.
Meter:	Ammeter 0 - 25 Amperes	Ammeter 0 - 15 Amperes
Weight:	29 pounds	20 pounds
Size:	Height 8"; Width 9½"; Depth 7"	Height 8"; Width 9½"; Depth 7"

MODELS FR 20-B-20 AND FR 20-B-10 REPLACEMENT PARTS

To order, specify component and part number:

Description	Model on which part is used		Part Number
	FR 20-B-10	FR 20-B-20	
Capacitor, 660 VDC, 3uF	X		019702-77
Capacitor, 660 VDC, 4uF		X	019702-78
Transformer, Power	X		010041-13-1
Transformer, Power		X	010040-24-1
Diode, 40 HF 10	X	X	010040-24-3
Diode, 40 HFR 10	X	X	010040-24-4
Switch, Power Tap	X	X	010041-13-2
Circuit Breaker, 60 Amp	X	X	010041-13-3
Ammeter, 0 - 15 Amp, DC	X		010041-13-4
Ammeter, 0 - 30 Amp, DC		X	010041-24-2

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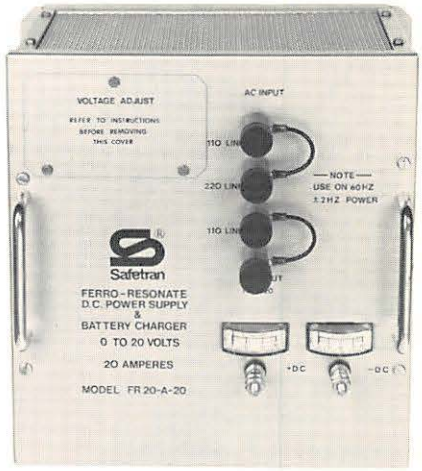
FERRO-RESONANT BATTERY CHARGERS

FR 20-A-10, FR 20-A-20

Model FR 20-A-10



Model FR 20-A-20

Safetran Models FR 20-A-10 and FR 20-A-20 Ferro-Resonant Battery Chargers provide nearly constant voltage output after being adjusted to the proper voltage level for the battery. This provides for rapid recovery after power outage without subsequent overcharging. Under conditions of varying load, the charger will assume most of the load, floating the battery and keeping it near maximum charge.

The special input transformer sets the output voltage in proportion to the load demands, state of battery charge, battery voltage and conditions in conjunction with the adjustable transformer.

The fixed ferro-resonant input transformer utilizes a third winding which is resonated with a capacitor. This, together with the special transformer configuration, gives a self-regulated output voltage over a wide range of line and output voltages to match the battery voltage.

The Model FR 20-A-10 may be used for any battery requiring a float voltage up to 20 volts. The rated output current is 10 amperes at all output voltages.

The Model FR 20-A-20 may be used for any battery requiring a float voltage up to 20 volts. The rated output current is 20 amperes at all output voltages. This charger is specially suited for heavy and irregular loads.

FERRO-RESONANT BATTERY CHARGES ORDERING INFORMATION

To Order: Specify Model Number and Part Number.

Model Number	Input Values		Output Values		Dimensions In Inches			Weight In Pounds	Part Number
	Voltage (AC)	Frequency (Hertz)	Voltage (DC)	Amperes	Height	Width	Depth		
FR 20-A-10	115/230	60	0-20	10	6	12	10	30	010041-X
FR 20-A-20	115/230	60	0-19	20	13	12-1/2	9	50	010040-X

REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Description	Model On Which Part Is Used		Part Number
	FR 20-A-10	FR 20-A-20	
Transformer, Power		X	019801-72
Transformer, Power	X		019801-74
Transformer, Power	X		019801-75A
Transformer Assembly		X	010040-19X
Capacitor, (4μF, 660VDC)	X		019702-72
Capacitor, (6μF, 660VDC)		X	019702-76
Capacitor, (39,500μF, 25VDC)	X		019702-78
Capacitor, (84,000μF, 25VDC)		X	019702-77
Resistor, (100 Ohm, 50W)		X	019601-32
Resistor, (200 Ohm, 25W)	X		019601-33
Diode	X	X	019910-3492
Ammeter, 0-15 Amps	X		010041-7
Ammeter, 0-30 Amps		X	010040-11
Voltmeter, 0-20 Volts	X	X	010040-12

Safetran

BATTERY REGULATORS

AUTOMATIC TEMPERATURE COMPENSATED

- **OUTPUT VOLTAGE VARIES WITH TEMPERATURE CHANGE**
- **FULL BATTERY CHARGE ASSURED WITHOUT OVERCHARGE**
- **CELL CONFIGURATION ADAPTERS FOR 5-18 CELLS OF BATTERY**

Lead Acid and Nickel Iron batteries must be kept at a higher voltage in cold weather than in warm to maintain a full charge. Safetran Model ATC Battery Regulators automatically compensate for this by measuring the temperature of the electrolyte and continuously varying its output voltage as the temperature changes. A full charge is assured without fear of overcharge regardless of the ambient temperature.

These battery regulators will maintain an output voltage constant within 0.1 volt with fluctuations in load and with changes in line voltage of up to 20%. The charge rate depends upon the difference between the cell and charge voltages and rises rapidly to its maximum value as the cell voltage decreases or as the cell becomes discharged. When a load is applied to the battery and charger combination, the charger will assume the entire load until its capacity is reached. The battery is required only to supply loads in excess of this and will recharge quickly once the load is removed.

Temperature Compensation
5.4 mV/degrees centigrade/cell (Lead)
3.5 mV/degrees centigrade/cell (Ni-Fe)
.2 mV/degree centigrade/cell (Ni-Cad)

BATTERY REGULATORS AUTOMATIC TEMPERATURE COMPENSATED ORDERING INFORMATION

The Model ATC Battery Regulators have an input voltage of 105-115 VAC or 210-230 VAC. Line voltage may vary ±20% from nominal.

To Order: Specify Model Number and Part Number

Model Number	Output Values (DC)		Battery Cells		Dimensions In Inches			Weight In Pounds	Part Number
	Volts	Amperes	Lead	Ni-Fe Ni-Cad	Height	Width	Depth		
ATC 8	0.1	9-10.5	5-12	7-18	12	9-1/4	8	33	010019-X
ATC 12	0.2	12.5-15.5	5-12	7-18	12	13-3/8	8-5/16	42	010021-X
ATC 20	0.1	23-27	5-12	7-18	12	13-3/8	8-5/16	54	010024-X

CELL CONFIGURATION ADAPTERS

To Order: Specify Number of Cells and Part Number.

Number of Cells	Part Number Type of Battery Cell		
	Ni-Fe	Lead	Ni-Cad
5	——	010050-4X	——
6	——	010051-2X	——
7	010052-2X	010058-2X	010072-X
8	010053-2X	010059-2X	010066-2X
9	010054-2X	010065-2X	010069-2X
10	010055-2X	010073-X	010067-2X
11	010056-2X	010074-X	010060-2X
12	010057-2X	010061-2X	010068-2X
13	010075-X	——	010070-X
14	010064-2X	——	010079-X
15	010076-X	——	010080-X
16	010077-X	——	010081-X
17	010078-X	——	010082-X
18	010071-2X	——	010083-X

Note: Adapters for II pin sockets are listed above and will be furnished unless 8 pin replacement adapter is specified for earlier ATC models.

REPLACEMENT PARTS

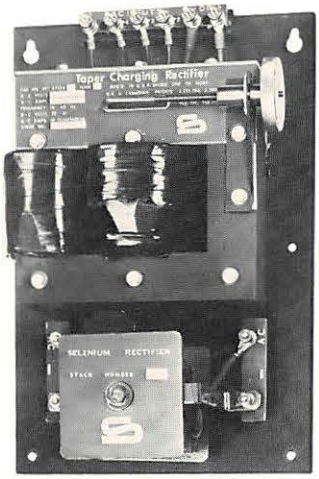
To Order: Specify Description and Part Number.

Description	Part Number
CLVC Circuit Board Assembly	010002-X
PSFC Circuit Board Assembly	010003-X
Temperature Compensator Assembly	010005-X

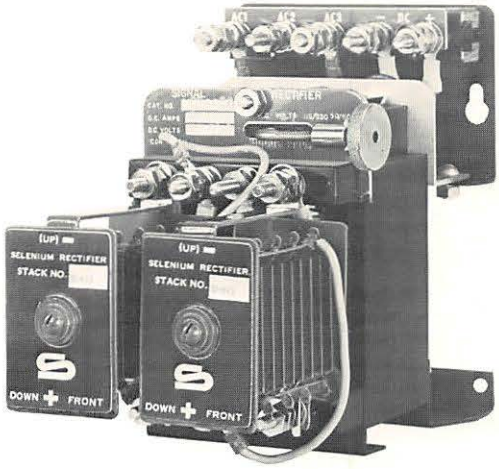
Safetran

TAPER CHARGING SIGNAL RECTIFIERS

HPT, HTT



Model HPT



Model HTT

Safetran Models HPT and HTT Taper Charging Signal Rectifiers deliver a varying DC output in proportion to the load demands and state of battery charge, voltage, and condition. While not a constant voltage rectifier as Safetran's other automatic rectifiers, the current output varies to compensate for a changing load.

Once adjusted for the charging rate required at a specific location, the charge rises and falls under changing load conditions. Any increase in battery load raises the charging rate, which tapers off during normal or low load periods, to the original floating rate when the battery voltage reaches the fully charged value of the cell.

Regulation of output is controlled by properties of the special design transformers and selenium rectifying element alone. External control devices are not required.

Easily replacable self-protected selenium rectifying elements are mounted on AAR terminals on the face of the unit, replacing the conventional enclosure and permanently wired elements.

This arrangement makes possible rapid field inspection and/or replacement of elements at location without disconnecting the rectifier from the circuitry.

The DC output is adjustable within separate high and low outputs on the Model HTT; whereas, the Model HPT is adjustable within any of three separate outputs (high, medium, low).

TAPER CHARGING SIGNAL RECTIFIERS ORDERING INFORMATION MODEL HPT

The Model HPT Rectifier transformer has a tapped single coil primary for either 115 or 230 VAC, 50-60 Hz supply.

To Order: Specify Model HPT Rectifier and Part Number.

Operation Volts (AC)	Output Values (DC)			Battery Cells		Part Number	Rectifier Stack Replacement Part Number
	Volts	Maximum Amperes		Lead	Ni-Fe Ni-Cad		
		Continuous	Intermittent				
115	8-15.5	20	27	4-7	5-10	014600-X	014025-1X
230	8-15.5	20	27	4-7	5-10	014600-AX	014025-1X
115	22-31	10	15	11-14	14-20	014601-X	014025-3X
230	22-31	10	15	11-14	14-20	014601-AX	014025-3X

Dimensions all units: Height - 18 inches; Width - 12 inches; Depth - 8 inches, and Weight - 75 pounds.

MODEL HTT

The Model HTT Rectifier transformers have dual primaries for 115/230 VAC, 50-60 Hz supply. The primary of the transformer is made up of two coils which can be connected in parallel for 115 VAC supply, or connected in series for 230 VAC supply. Rectifiers wired for 230 VAC supply are for 160°F ambient temperature signal case service.

To Order: Specify Model HTT Rectifier and Part Number.

Operation Volts (AC)	Output Values (DC)			Battery Cells		Depth* In Inches	Weight In Pounds	Part Number
	Volts	Maximum Amperes		Lead	Ni-Fe Ni-Cad			
		Continuous	Intermittent					
115/230	.9-3	2.3	3.5	1	1	6-1/4	14	014000-8223X
115/230	8-13.5	3.5	5	4-6	5-9	7-1/2	15	014000-8535X
115/230	8-15.5	7	10	4-7	5-10	8-1/4	16	014000-8670X
115/230	16-23	5	7	8-10	11-15	8-1/4	16	014000-8650X

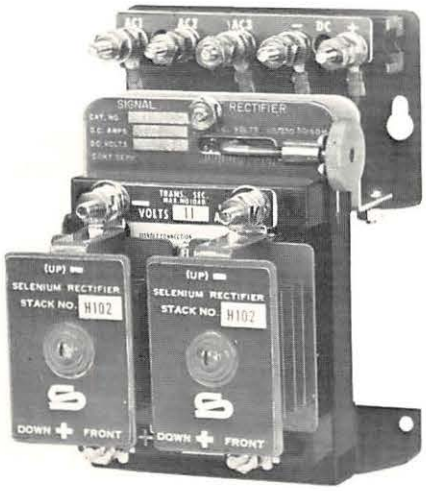
*Only Depth is variable. Dimensions all Units: Height — 7-1/2 inches, Width—5-1/2 inches.

For replacement of Model HTT Rectifier Stack, order Part Number 014034-2X.

Safetran

ADJUSTABLE TRANSFORMER SIGNAL RECTIFIER

MODEL HT



- **DESIGNED FOR CONTINUOUS SERVICE**
- **NO ROUTINE OR PREVENTATIVE MAINTENANCE REQUIRED**
- **MEETS OR EXCEEDS APPLICABLE AAR SPECIFICATIONS**

Safetran Model HT Signal Rectifiers are constant current type, adjustable power units for battery charging. They are designed for continuous service at name plate current and voltage ratings in maximum surrounding air temperature of 160 degrees Fahrenheit.

The Model HT has two identical selenium rectifier stacks arranged with brackets for quick mounting and connecting without soldered connections to AAR signal terminal studs on the face of the unit. These stacks may be easily inspected and/or replaced in the field if damaged without disconnecting the rectifier from the circuitry.

These full wave center tap circuit rectifiers may be operated temporarily half wave with one stack for normal load requirements by readjusting the transformer in case of damage to one stack. The full wave center tap arrangement is used since the stacks are fully self-connecting or self-disconnecting when attached to or removed from the studs.

The no load maximum AC voltage rating, stack number, line terminals and markings, as well as a permanently attached circuit and connecting diagram face forward for ease of reading.

The Model HT may be either wall or shelf mounted as desired.

ADJUSTABLE TRANSFORMER SIGNAL RECTIFIERS ORDERING INFORMATION

MODEL HT

The Model HT Rectifier transformers have dual primaries for 115/230 VAC, 50-60 Hz supply. The primary of the transformer is made up of two coils which can be connected in parallel for 115 VAC supply, or connected in series for 230 VAC supply. Rectifiers wired for 230 VAC supply are for 160°F ambient temperature signal case service.

To Order: Specify Model HT Rectifier and Part Number.

Output Values (DC)		Battery Cells		Depth* In Inches	Weight In Pounds	Part Number	Rectifier Stack Replacement Part Number
Volts	Amperes	Lead	Ni-Fe Ni-Cad				
.8-3	2.2	1	1-2	5-1/4	10	014000-1222X	014652-X
.8-3	4.4	1	1-2	5-5/8	12	014000-1244X	014652-1X
3-7	2.2	2-3	3-4	6-1/4	14	014000-1322X	014652-2X
3-7	4.4	2-3	3-4	6-5/8	16	014000-1344X	014652-3X
7-13.5	0.5	4-6	5-9	4-3/4	9	014000-1505X	014652-4X
7-13.5	1.7	4-6	5-9	6-1/8	14	014000-1517X	014652-5X
7-13.5	2.7	4-6	5-9	7-1/4	16	014000-1527X	014652-6X
7-13.5	3.3	4-6	5-9	7-1/2	19	014000-1533X	014652-6X
7-13.5	4.8	4-6	5-9	8-1/4	20	014000-1548X	014652-7X
13-15.5	3.0	6-7	9-10	7-1/2	19	014000-1630X	014652-6X
15-20	3.5	7-9	10-13	8-1/4	20	014000-1635X	014652-8X
21-27	2.7	10-12	13-18	8-1/4	20	014000-1727X	014652-10X
22-31	1.3	11-14	14-20	7-1/4	16	014000-1713X	014652-9X

*Only Depth is variable. Dimensions all Units: Height — 7-1/2 inches, Width — 5-1/2 inches.

Safetran

TRACK AND LIGHTING TRANSFORMERS

Fixed Voltage
Lighting Transformer

Track Transformer

Switch Lighting
Transformer

Safetran Fixed Voltage Lighting Transformers are available in two models of 20 and 50 amperes. Secondary voltage taps are provided for 1 to 15.5 VAC. Excellent voltage regulation is assured through use of heavy cores and windings.

These transformers may be shelf, backboard, or relay rack mounted. With proper adaptor supplied, these transformers may also be mounted to relay racks manufactured by GRS and WABCO.

The Track Transformer has 3 separate secondary outputs of 1,2, and 6 VAC; each rated at 5 amps each. The unit is also provided with a primary low voltage tap to compensate for reduced power line voltage.

The Switch Lighting Transformers are high quality units with all primary and secondary leads clearly marked.

Each lead is furnished with a solderless terminal for connection to AAR terminals. A tag or plate is supplied with each transformer showing secondary voltage combinations and indicates how they are obtained. These transformers measure 3-1/2 inches in height, 3 inches in width, 3-3/8 inches in length, and weigh 4 pounds.

These transformers meet or exceed all applicable AAR specifications.

TRACK AND LIGHTING TRANSFORMERS ORDERING INFORMATION

FIXED VOLTAGE LIGHTING TRANSFORMERS

To Order: Specify Model Number and Part Number.

Model Number	Primary Volts (AC)	Secondary Volts (AC)	Output Maximum Amperes	Dimensions In Inches			Weight In Pounds	Part Number
				Height	Width	Depth		
SLT 20	115/230	*1-15.5	20	9-1/2	8-1/2	7	15	010520-20X
SLT 50	115/230	*1-15.5	50	9-1/2	8-1/2	7	29	010520-50X

*The secondary is tapped providing 1.0 to 8.0 VAC in 1 volt steps and 8.0 to 15.5 in 0.5 volt steps.

TRACK TRANSFORMER

To Order: Specify Model Number and Part Number.

Model Number	Primary Volts (AC)	Secondary Volts (AC)	Output Maximum Amperes	Dimensions In Inches			Weight In Pounds	Part Number
				Height	Width	Depth		
1011-1-30	110/115	1. 2, and 6	5	5-1/8	7-3/8	8-3/8	9-3/4	010500-1X

SWITCH LIGHTING TRANSFORMERS

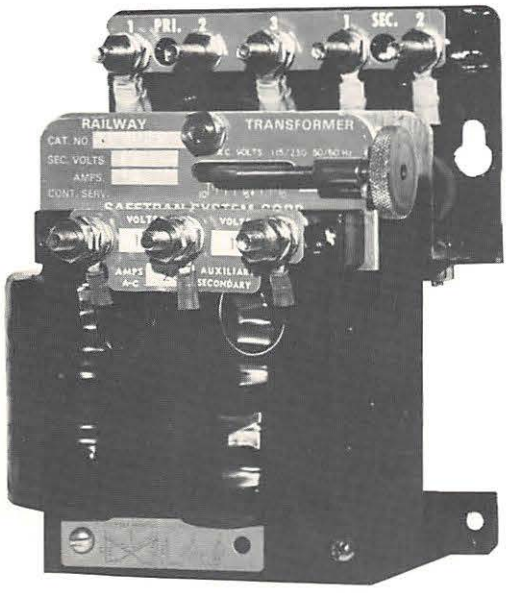
To Order: Specify Switch Lighting Transformer and Part Number.

Primary Voltage (AC)	Secondary Voltage (AC)	Secondary Output Maximum Amperes	Part Number
115	1/2, 1, 1-1/2, 2, 2-1/2, 3, 6-1/2, 7, 7-1/2, 8, 8-1/2, 9, 9-1/2, 10, 10-1/2, 11, 11-1/2, 12, 12-1/2, 13, 13-1/2	2.5	010599-109X
115	1/2, 1, 1-1/2, 2, 2-1/2, 3, 6-1/2, 7, 7-1/2, 8, 8-1/2, 9, 9-1/2, 10, 10-1/2, 11, 11-1/2, 12, 12-1/2, 13, 13-1/2	5	010599-105X
230	1/2, 1, 1-1/2, 2, 2-1/2, 3, 6-1/2, 7, 7-1/2, 8, 8-1/2, 9, 9-1/2, 10, 10-1/2, 11, 11-1/2, 12, 12-1/2, 13, 13-1/2	2.5	010599-107X
230	1/2, 1, 1-1/2, 2, 2-1/2, 3, 6-1/2, 7, 7-1/2, 8, 8-1/2, 9, 9-1/2, 10, 10-1/2, 11, 11-1/2, 12, 12-1/2, 13, 13-1/2	5	010599-108X
115	1, 2, 3, 7, 8, 9, 10, 11, 12, 13	2.5	010599-102X
115	1, 2, 3, 7, 8, 9, 10, 11, 12, 13	5	010599-101X
230	1, 2, 3, 7, 8, 9, 10, 11, 12, 13	2.5	010599-104X
230	1, 2, 3, 7, 8, 9, 10, 11, 12, 13	5	010599-103X
115	2, 4, 4, 6, 8, 8, 10, 12, 14, 16	5	010599-106X
115	4, 8, 12, 16, 20, 24	5	010599-110X

Safetran

SIGNAL TRANSFORMERS

MODEL AT



Model AT Variable Voltage
Signal Transformer

- **115/230 VAC SUPPLY**
- **ADJUSTABLE SECONDARY VOLTAGE/CURRENT**
- **MEETS OR EXCEEDS APPLICABLE AAR SPECIFICATIONS**

Safetran Variable Voltage Model AT Signal Transformers have two primary coils which may be connected in parallel for 115 VAC supply, or in series for 230 VAC supply.

Secondary voltage/current adjustment may be made via thumb nut acting on a moveable core.

Through a patented coil and circuit arrangement, secondary voltage regulation is sufficiently close to avoid over-voltaging and burnout of remaining lamps in a group with the outage of one or more lamps.

In addition to the variable voltage secondary, models are available with an auxiliary isolated secondary of 11 volts (10-1) and .25 amperes AC capacity for power off relay or other constant voltage low current applications.

Terminals of this auxiliary secondary are on the face of the transformer. This isolated secondary can also be supplied in other voltage and current ratings up to 3 VA capacity.

All terminals and data plates face forward for reference in connecting the transformer after installation.

MODEL AT SIGNAL TRANSFORMERS ORDERING INFORMATION

To Order: Specify Model AT Signal Transformer and Part Number.

Part Number 115/230 VAC Input *		Secondary AC		Depth** In Inches	Weight In Pounds
Without Auxiliary Secondary	With Auxiliary Secondary	Volts	Amperes		
014000-904	014000-904X	9-12	16	5-3/8	16
014000-907	014000-907X	11-15	8	4-5/8	13
014000-908	014000-908X	11-15	16	5-3/8	16

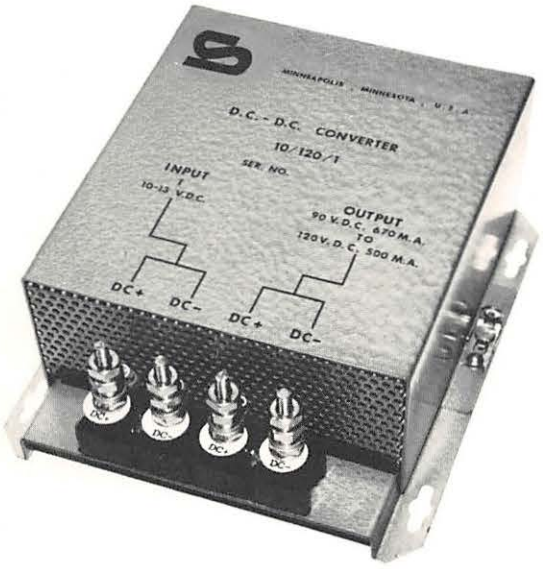
* Transformers are shipped with Primaries connected for 115 VAC. Connections for 230 VAC may be made in the field.

** Only depth is variable. Dimensions all units: Height — 7 inches, Width — 5-1/2 inches. Add 3/4 inch to depth for units with Auxiliary Secondary.

Safetran

CONVERTERS

(DC TO DC)



- **PROVIDES ISOLATED DC SOURCE FOR TRACK CIRCUIT OR CODE LINE**
- **COMPLETELY SOLID STATE**
- **NO ROUTINE OR PREVENTIVE MAINTENANCE REQUIRED**

Safetran DC-DC Converters are completely solid state. They utilize only two power transistors with high reverse voltage breakdown. Zener diodes are incorporated for protection against transistor damage due to transients or surges. Both the input and output are provided with surge protection networks to increase protection against lightning damage.

No routine or preventative maintenance is required for these converters. Total isolation from the operating battery is provided as well as isolation between outputs on multiple output units.

ORDERING INFORMATION

To Order: Specify Model Number and Part Number.

Model Number	Input Values		Output Values		Number of Outputs	Maximum Amperes Per Output	Dimensions In Inches			Weight in Pounds	Part Number
	Voltage (DC)	Maximum Amperes	Voltage (DC)	Maximum Amperes			Height	Width	Depth		
10/2.5-2	10-12	2.3	2.5	6.0	2	3.0	5-1/4	7-1/2	7-7/8	6	010219-X
10/2.5-5	10-12	5.0	2.0	12.5	5	2.5	9-1/2	6	6-1/4	7	010240-X
10/120-1	10-12	5.19	90-120	2-2.68	1*	.50-.67	3-5/16	7-3/4	8-3/8	5-3/4	010200-X
20/120-1	20-25	3.0	90-120	2-2.68	1*	.50-.67	7	5	5	5-3/4	010242-X

* This Model has four positions for the output ranges listed.

CONVERTERS REPLACEMENT PARTS

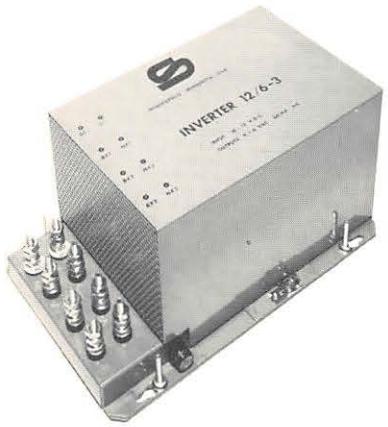
To Order: Specify Description and Part Number.

Description	Model on Which Part is Used				Part Number
	10/2.5-2	10/2.5-5	10/120-1	20/120-1	
Transistor, Power	X	X	X	X	019920-3772
Transformer, Toroidal			X		019801-12
Transformer, Toroidal	X				019801-23
Transformer, Toroidal		X			019801-25
Transformer, Toroidal				X	019801-26
Capacitor (100 μF, 25 V)	X	X			019702-36
Capacitor (5 μF, 50 V)	X	X			019702-28
Capacitor (10 μF, 50 V)			X	X	019702-15
Capacitor (100 μF, 50 V)			X	X	019702-12
Capacitor (100 μF, 50 V)	X	X	X	X	019702-13
Coil, Choke	X		X	X	010805-1
Coil, Choke	X	X			010802-7
Resistor, 4 Ohm			X	X	019601-5
Resistor, 10 Ohm	X	X	X	X	019601-8
Resistor, 100 Ohm			X		019601-4
Resistor, 240 Ohm	X	X			019520-241
Resistor, 18 kOhm			X	X	019420-183
Diode, Rectifier		X			019900-41
Diode, Rectifier				X	019910-1566A
Diode, Rectifier	X		X	X	019910-2482
Diode, Rectifier				X	019910-3193
Diode, Rectifier	X	X			019910-3210
Diode, Rectifier			X		019910-4820
Diode, Zener	X				019910-2989A
Diode, Zener		X	X	X	019910-3001B
Fuse (4 Amp)	X			X	010219-6
Fuse (6 Amp)		X			010700-15
Fuse (7.5 Amp)			X		010206
Battery Selector Switch			X	X	010211
Tap Switch			X	X	010210

Safetran

GENERAL PURPOSE DC/AC INVERTERS

MODELS 12/6-3, 12/115-1



- **COMPLETELY SOLID STATE**
- **NO ROUTINE OR PREVENTATIVE MAINTENANCE REQUIRED**
- **MEETS OR EXCEEDS APPLICABLE AAR SPECIFICATIONS**

Safetran DC-AC Inverters have been designed to meet the requirements for general standby power supplies for railroad signal applications. These Inverters have a number of features not ordinarily found in commercial inverters including: power transistors with a high inverse voltage breakdown, zener diodes providing protection against transients, built-in surge protection networks, and isolated power transistors and heat sinks to avoid accidential grounding of signal battery.

The Model 12/6-3 has been designed specifically for use with type C track circuits employing feed and DC track relay at one end and rectifier at the opposite end of the circuit.

The Model 12/115-1 has been designed as a general purpose 115V 60 Hz standby power supply for railroad signal applications. However, frequency as well as output voltage will vary with input voltage and load. They should not be used where constant frequency and voltage are critical. Output voltage is a square wave with some harmonic filtering.

No routine or preventative maintenance is required for these inverters.

ORDERING INFORMATION

To Order: Specify Model Number and Part Number.

Model Number	Input Values		Output Values		Maximum Amperes Per Output	Number of Outputs	Dimensions in Inches			Weight in Pounds	Part Number
	Voltage (D.C.)	Maximum Amperes	Voltage (A.C.)	Frequency (Hertz)			Height	Width	Depth		
12/6-3	10-12	9-11	5-6	53-63	4.0	3	6-1/8	7-1/2	12-1/4	14.5	010218-X
12/115-1	10-12	17-20	95-104	50-60	1.4-1.5	1	5	7-11/16	10-7/32	17	010227-X

GENERAL PURPOSE DC/AC INVERTERS REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Description	Model On Which Part is Used		Part Number
	12/6-3	12/115-1	
Power Transistor		X	019920-2156
Power Transistor	X		019920-3772
Transformer, Toroidal	X	X	019801-31
Transformer, Output	X		019801-15
Transformer, Output		X	019801-34
Capacitor (50μF, 50V)		X	019702-37
Capacitor (100μF, 50V)	X	X	019702-13
Coil, Choke	X	X	010802-7
Resistor, 3 Ohm		X	019601-9
Resistor, 10 Ohm	X	X	019601-8
Resistor, 100 Ohm		X	019601-21
Resistor, 240 Ohm	X		019520-241
Thyrector	X		019901-3
Diode, Rectifier		X	019900-41
Diode, Zener		X	019910-2982A
Diode, Zener	X		019910-3001B
Diode, Zener	X		019910-4720
Fuse (15 Amp)	X		010218-5
Fuse (20 Amp)		X	010227-1

Safetran

CONSTANT FREQUENCY DC/AC INVERTERS

MODELS 24/115-1, 24/115-1A

- **COMPLETELY SOLID STATE**
- **NO ROUTINE OR PREVENTATIVE MAINTENANCE REQUIRED**
- **MEETS OR EXCEEDS APPLICABLE AAR SPECIFICATIONS**

Safetran DC-AC Inverters have been designed to meet the requirements for general standby power supplies for railroad signal applications. These Inverters have a number of features not ordinarily found in commercial inverters including: power transistors with a high inverse voltage breakdown, zener diodes providing protection against transients, built-in surge protection networks, and isolated power transistors and heat sinks to avoid accidential grounding of signal battery.

The Model 24/115-1 and 24/115-1A Inverters designed for coded track/cab signal, furnish 115V 60 Hz and 115V 100 Hz respectively for standby or continuous operation. Frequency is constant allowing use with above equipment. Output voltage is a square wave with some harmonic filtering.

These inverters require no routine or preventative maintenance.

ORDERING INFORMATION

To Order: Specify Model Number and Part Number.

Model Number	Input Values		Output Values		Maximum Amperes Per Output	Number of Outputs	Dimensions in Inches			Weight in Pounds	Part Number
	Voltage (D.C.)	Maximum Amperes	Voltage (A.C.)	Frequency (Hertz)			Height	Width	Depth		
24/115-1	20-26	20-30	99-134	60	3.5-4.1	1	8-1/2	10-1/2	12	33	010244-X
24/115-1A	24-26	17	115	100	3.5	1	8-1/2	10-1/2	12	33	010243-X

CONSTANT FREQUENCY DC/AC INVERTERS REPLACEMENT PARTS

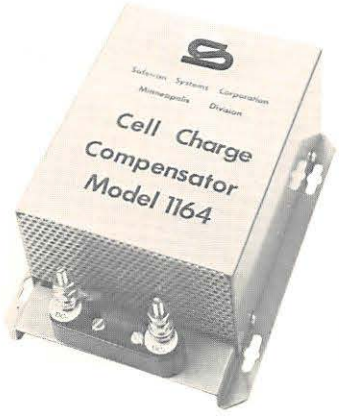
To Order: Specify Description and Part Number.

Description	Model On Which Part is Used		Part Number
	24/115-1	24/115-1A	
Power Transistor	X	X	019920-1711
Power Transistor	X	X	019920-3055
Power Transistor	X	X	019920-3772
Transformer, Toroidal	X		019801-60
Transformer, Toroidal		X	019801-62
Transformer, Output	X	X	019801-59
Capacitor (100μF, 25V)	X	X	019702-36
Capacitor (500μF, 50V)	X	X	019702-67
Capacitor (.01μF, 100V)	X	X	019701-1
Coil, Choke	X	X	010802-7
Coil, Choke	X	X	010810-2
Resistor, 1 Ohm	X	X	019601-29
Resistor, 10 Ohm	X	X	019601-30
Resistor, 20 Ohm	X	X	019505-200
Resistor, 100 Ohm	X	X	019505-101
Resistor, 150 Ohm		X	019405-102
Resistor, 2.0 kOhm	X	X	019600-5
Resistor, 3.16 kOhm	X	X	019600-4
Resistor, 4.64 kOhm	X	X	019600-43
Diode, Rectifier	X	X	019900-41
Diode, Zener	X	X	019910-825
Diode, Zener	X	X	019910-2990A
Diode, Zener	X	X	019910-5059
Fuse, Output (4 Amp)	X	X	010219-6
Fuse (25 Amp)	X	X	010001-12

Safetran

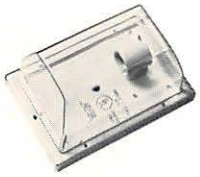
BATTERY ACCESSORIES

CELL CHARGE COMPENSATOR, POWER OFF INDICATORS, BATTERY FILLER, BATTERY TERMINALS



Cell Charge Compensator

Battery Filler

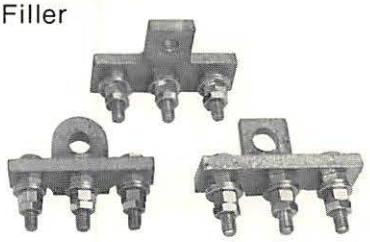


051958-X

020461-3X

031219-6X

Power Off Indicators



Battery Terminals

Safetran Model 1164 Cell Charge Compensators are designed to prevent overcharge and gassing of a lightly loaded cell(s) at the end of a series of cells operated from a single charger. The end cell(s) overcharges due to an intermittent load on it and a constant load on the remaining cells. The compensator shunts the current past the end cell when it is fully charged. These compensators are available for 1 to 3 cells, either lead acid or nickel cadmium. They have a 30 amp battery charger current rating.

Safetran's internally mounted Power Off Indicator is constructed of a cast iron frame, bakelite lamp base, and a glass magnifying lens. Models are available for both single contact bayonet base and screw type base bulbs. Hardware is included for mounting either to wood or metal housings.

Safetran's externally mounted Power Off Indicator, with extended frame to allow for observation from all sides of housing, encloses a single contact bayonet base type bulb within its clear Fresnel lens.

Another externally mounted Power Off Indicator, which mounts on the side of the housing, accepts standard screw base bulbs and has a clear plastic case.

Safetran's Battery Filler, with nozzels for use with lead acid or nickel alkali batteries, is constructed of polyethylene plastic. This rugged two quart container is designed to safely fill, but not overfill, battery cells.

Safetran Multi-Connection Battery Terminals, constructed of hot tin dipped cast bronze, are available for lead acid, nickel cadmium, and nickel iron batteries.

BATTERY ACCESSORIES ORDERING INFORMATION

MODEL 1164 CELL CHARGE COMPENSATORS

To Order: Specify Model Number and Part Number.

Model Number	Capability Number of Cells	Dimensions In Inches			Part Number
		Height	Width	Depth	
1164-1	1	3-1/2	6-1/4	8-1/4	010137-9X
1164-2	2	3-1/2	6-1/4	8-1/4	010137-X
1164-3	3	3-1/2	6-1/4	8-1/4	010137-10X

POWER OFF INDICATORS

To Order: Specify Description and Part Number.

Description	Base Type	Part Number
Power Off Indicator, internal mount	Single contact bayonet	020461-5X
Power Off Indicator, internal mount	Standard screw	020461-2X
Power Off Indicator, external mount	Single contact bayonet	031219-6X
Power Off Indicator, external mount	Standard screw	051958-X

MULTI-CONNECTION BATTERY TERMINALS

To Order: Specify Description and Part Number.

Description	Part Number
Battery Terminal, lead acid	023100-X
Battery Terminal, nickel cadmium, 5/16″ battery post diameter	023101-X
Battery Terminal, nickel cadmium, 3/8″ battery post diameter	023101-1X
Battery Terminal, nickel cadmium, 1/2″ battery post diameter	023101-2X
Battery Terminal, nickel iron, tapered post	023102-X

BATTERY FILLERS

To Order: Specify Description and Part Number.

Description	Part Number
Battery Filler for lead acid batteries	032337-1X
Battery Filler for nickel alkali batteries	032337-2X
Battery Filler for nickel alkali and lead acid batteries	032337-3X

Section H

Safetran

SURGE PROTECTION

SECTION H

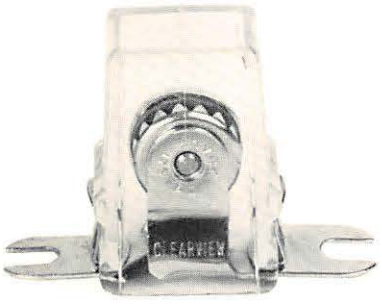
CONTENTS

Product	Subsection
Lightning Arresters	1
Equalizers	2
AC Power Line Protector	3
Surge Protection Equipment	4

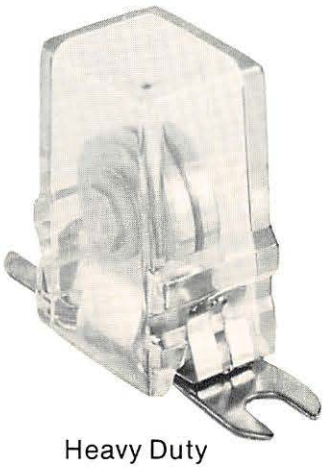
Safetran

AIR GAP ARRESTERS

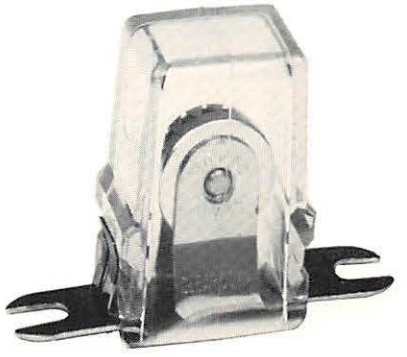
CLEARVIEW®, HEAVY DUTY, CLEAR-COMM



Clearview®



Heavy Duty



Clear-Comm

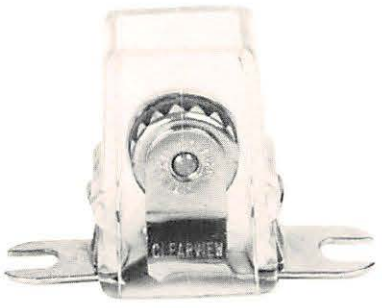
The Clearview® Lightning Arrester is an air gap type with 16 discharge point electrodes. It has a large safety factor against shorting due to this open toothed construction. It operates on 0-50 VDC for use on all low voltage signal circuits and 0-175 VAC for 115 VAC power circuits. The Clearview® has a consistent breakdown voltage of 700-1000 volts. The Clearview is composed of a discharge unit, with the name CLEARVIEW stamped in one of the mounting clips for identification, and clear plastic cap.

The Heavy Duty Lightning Arrester is a full air gap type for use on track circuits or where extremely high surge currents are experienced. It operates on 0-50 VDC for use on all low voltage signal circuits and 0-175 VAC for 115 VAC power circuits. The Heavy Duty has a consistent breakdown voltage of 700-1000 volts. The Heavy Duty is composed of a discharge unit with circular rather than point discharge electrodes, with the name H.D. ARRESTER stamped in one of the mounting clips for identification, and clear plastic cap.

The Clear-Comm Lightning Arrester is an air gap type with 16 discharge point electrodes designed to be used with communications circuits. It operates on either 0-100 VDC or 0-30 VAC. The Clear-Comm has a consistent breakdown voltage of 400-700 volts. The Clear-Comm is composed of a discharge unit, with the name CLEAR-COMM stamped in one of the mounting clips for identification, and clear plastic cap.

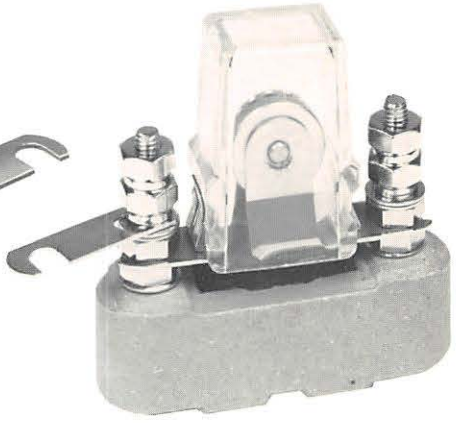
All three types of arresters have standard mounting centers of 2-3/8 inches. They also meet or exceed all applicable AAR specifications.

CLEARVIEW® LIGHTNING ARRESTER ORDERING INFORMATION

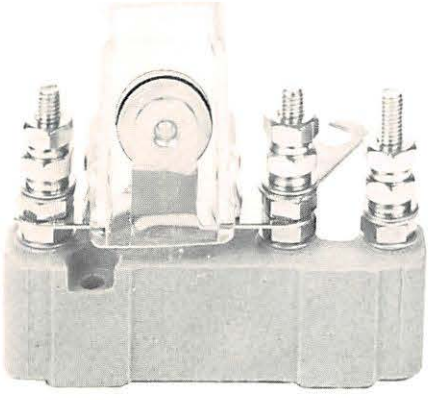


Clearview®
Lightning Arrester

Clearview® Lightning Arrester
on Bakelite Base



Clearview® Lightning Arrester
on Porcelain Base



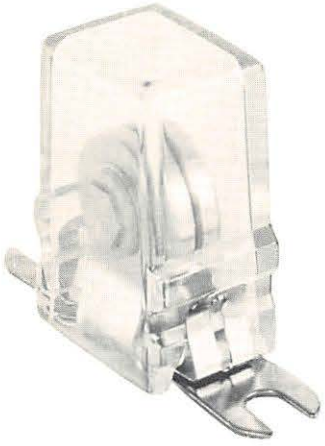
Clearview® Lightning Arrester
on 3 Post Porcelain Base

Dual Clearview® Lightning Arrester
on Porcelain Base

To Order: Specify Description and Part Number.

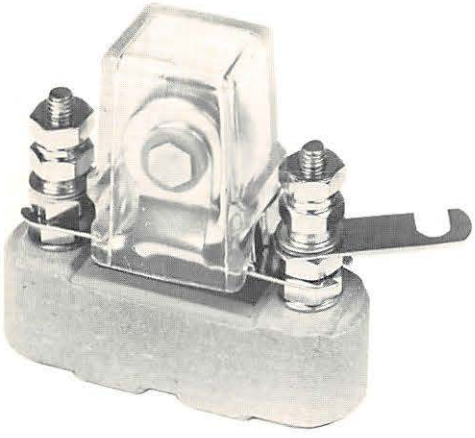
Description	Part Number
Clearview® Lightning Arrester	022485-28X
Clearview® Lightning Arrester mounted on Bakelite base	022485-31X
Clearview® Lightning Arrester mounted on Porcelain base	022485-32X
Clearview® Lightning Arrester on 3 post Porcelain base	022485-33X
Dual Clearview® Lightning Arrester on Porcelain base	022485-71X
Discharge Unit Only, Clearview® Lightning Arrester	022485-36X
Discharge Unit Only, Dual Clearview® Lightning Arrester	022485-66X
Protective Cap	022485-20

HEAVY DUTY LIGHTNING ARRESTER ORDERING INFORMATION



Heavy Duty Lightning Arrester

Heavy Duty Lightning Arrester on Porcelain Base



Heavy Duty Lightning Arrester on Bakelite Base

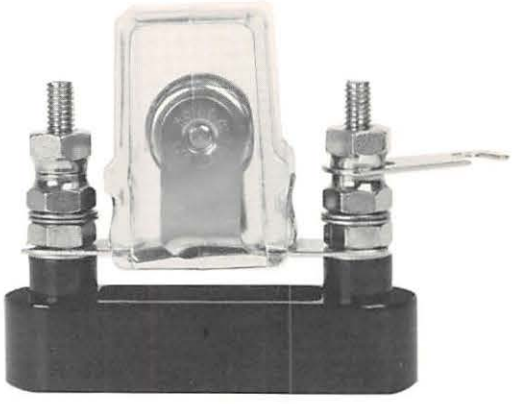
Heavy Duty Lightning Arrester on 3 Post Porcelain Base

To Order: Specify Description and Part Number.

Description	Part Number
Heavy Duty Lightning Arrester	022615-1X
Heavy Duty Lightning Arrester on Bakelite base	022615-2X
Heavy Duty Lightning Arrester on Porcelain base	022615-3X
Heavy Duty Lightning Arrester on 3 post Porcelain base	022615-4X
Discharge Unit Only	022615-5X
Protective Cap	022485-20

CLEAR-COMM LIGHTNING ARRESTER ORDERING INFORMATION

Clear-Comm Lightning Arrester



Clear-Comm Lightning Arrester on Bakelite Base

Clear-Comm Lightning Arrester on Porcelain Base

Clear-Comm Lightning Arrester on 3 Post Porcelain Base

To Order: Specify Description and Part Number.

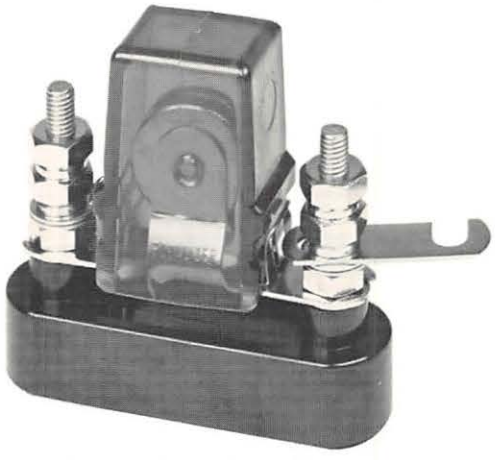
Description	Part Number
Clear-Comm Lightning Arrester	022485-50X
Clear-Comm Lightning Arrester on Bakelite base	022485-51X
Clear-Comm Lightning Arrester on Porcelain base	022485-52X
Clear-Comm Lightning Arrester on 3 post Porcelain base	022485-53X
Discharge Unit Only	022485-54X
Protective Cap	022485-20

Safetran

EQUALIZERS

HEAVY DUTY

Heavy Duty Equalizer



Heavy Duty Equalizer
Mounted on Bakelite Base

The Heavy Duty Equalizer is a closed circuit shunt type protector, for use on up to 24 VDC circuits. As a shunt, the equalizer has a minimum resistance of 1000 ohms; therefore, current leakage is low on the low voltage circuits for which the equalizer is recommended. The Equalizer retains its resistance and 75 to 150 VDC breakdown through long service life. The Heavy Duty equalizer consists of a discharge unit and red plastic cap. The name EQUALIZER appears on one mounting clip of the discharge unit, and each mounting clip spring is painted red for identification. This unit has standard mounting centers of 2-3/8 inches.

Several other assemblies are offered, including special arrangements for lamp filament protection, either mounted in signal head or on relay terminal posts.

A sealed equalizer is available for use on equipment subject to moisture or immersion in water. Although surge handling capability is not as great as the Heavy Duty Equalizer, resistance remains constant in the presence of moisture.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Heavy Duty Equalizer	022700-1X
Heavy Duty Equalizer Mounted on Bakelite Base	022700-5X
Heavy Duty Equalizer Mounted on Porcelain Base	022700-2X
Sealed, Watertight Equalizer	022700-36X
Discharge Unit Only	022700-7X
Protective Cap	022700-62

HEAVY DUTY EQUALIZERS FOR LAMP FILAMENT PROTECTION

Type H2 With Plug Coupler

Type H2 Without Plug Coupler

Type K Relay Size 4 or 6

Universal

Type K Relay Size 2

Type SA

Type SC

ORDERING INFORMATION

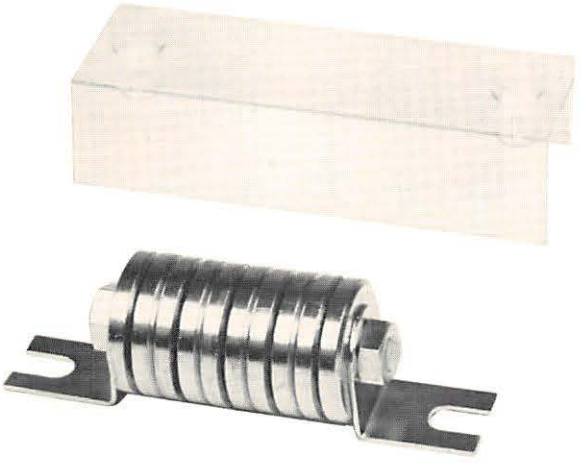
To Order: Specify Mounting Arrangement and Part Number.

Type of Mounting Arrangement	Part Number
Type H2 with Plug Coupler	022700-9X
Type H2 without Plug Coupler	022700-10X
Type K Relay Size 4 or 6	022700-31X
Universal	022700-33X
Type K Relay Size 2	022700-32X
Type SA	022700-21X
Type SC	022700-30X

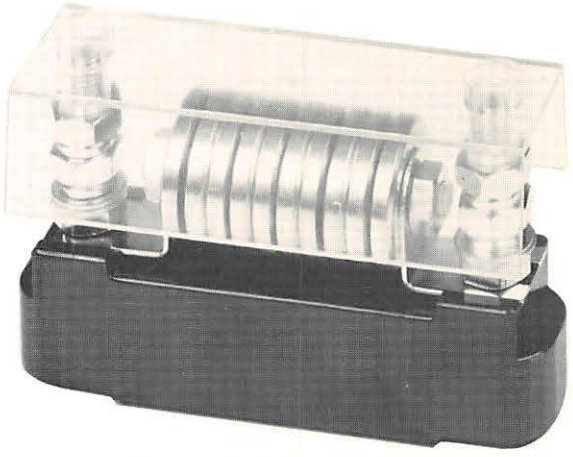
Safetran

AC POWER LINE PROTECTOR

MODEL 701-1



Model 701-1 AC Power Line Protector.



Model 701-1 AC Power Line Protector Mounted on Bakelite Base.

The Model 701-1 AC Power Line Protector is a shunt type heavy duty arrester for AC power lines. Applied across the incoming AC power leads, this unit is designed to shunt the surge and recover to normal under full AC power. No fuses or disconnects are required to protect this arrester. For supply transformers up to 1 KVA at 115 VAC, the transformer provides adequate series reactance to limit follow-through current. For capacities greater than 1 KVA at 115 VAC, two 701-1 protectors must be used in series to limit current so that the protectors can recover after a surge. This unit has a 1000 V breakdown between its terminals. The Model 701-1 protector can be furnished either as a single unit for mounting on 3-1/8 inch centers, or mounted on bakelite base. The Model 701-1 protector is the same protector as used on the AC Line Surge Protection Networks; therefore, this unit may be used as a direct replacement part for those networks. For 230 VAC systems, two 701-1 protectors must be used in series.

ORDERING INFORMATION

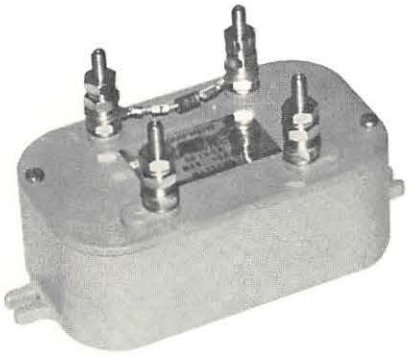
To Order: Specify Model Number and Part Number.

Description	Part Number
Model 701-1 Power Line Protector	022701-1X
Model 701-1 Power Line Protector Mounted on Bakelite Base	022701-2X
Plastic Protective Cap	022701-4

Safetran

SURGE PROTECTION EQUIPMENT

SURGE NETWORKS, SOLID STATE PROTECTORS, GAS ARRESTERS



Surge Network

Solid State Protector

Gas Arrester

The Surge Protection Networks, developed to provide solid state equipment protection, provide protection for devices using DC power, AC information circuits, and to protect against AC power line surges.

These units are categorized into four types as to their application. They are battery line protectors, AC line protectors, code line protectors, and track circuit protectors.

These surge protection networks are to be used as backup to primary arresters, equalizers, and power line protectors depending on the circuit and equipment to be protected.

The Surge Protection Networks are enclosed in a grey, plastic housing with cover, AAR Terminal Posts are located on the cover for external connection and mounting of arresters, equalizers, power protectors, and solid state protectors. The assembly as well as post designations are identified with label on cover.

The Solid State Protector is a shunting device designed to trigger at a specified low voltage to provide desired protection to solid state equipment. It is applied in conjunction with the Surge Protection Networks, Arresters, or Equalizers. It has terminal lugs with standard 2-3/8 inch mounting centers. It is available as either a single unit or mounted on bakelite terminal base.

A series of gas surge arresters provide low cost surge suppression. Rare gas discharge units are provided in several lower breakdown ratings than primary arresters. They should be used where surge levels are modest or as a backup to primary type (Clear view, heavy duty, equalize) arresters.

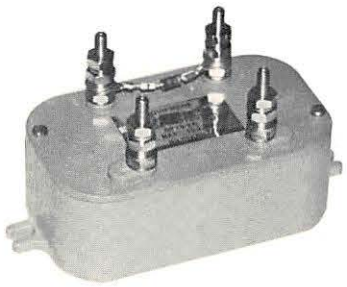
BATTERY LINE PROTECTORS

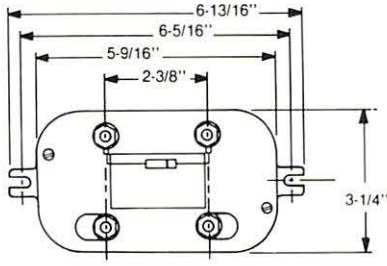
MODELS:

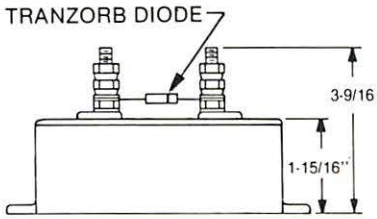
SP17-1A SP18-1A SP19-1A SP24-1A
SP17-1B SP18-1B SP19-1B SP24-1B

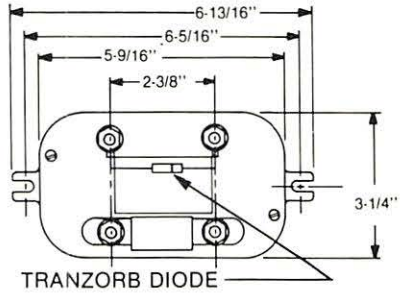
MODELS:

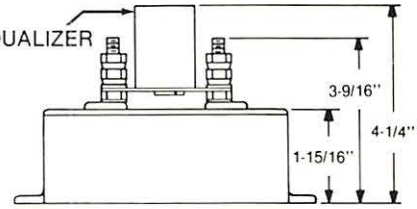
SP17-2A SP18-2A
SP19-2A SP24-2A









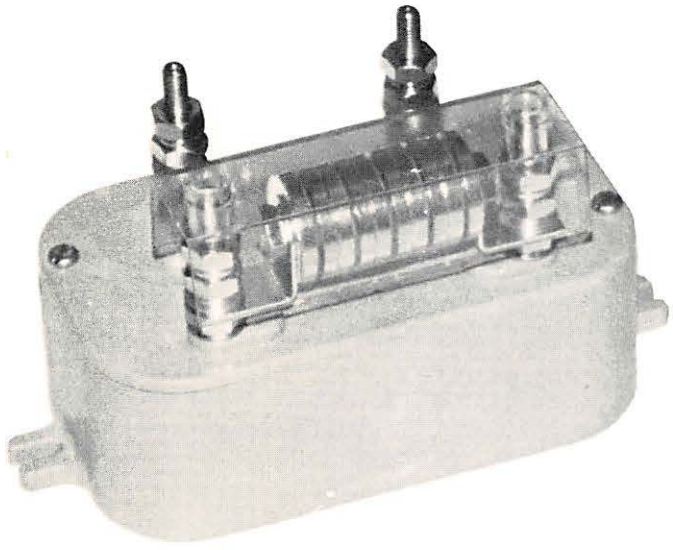


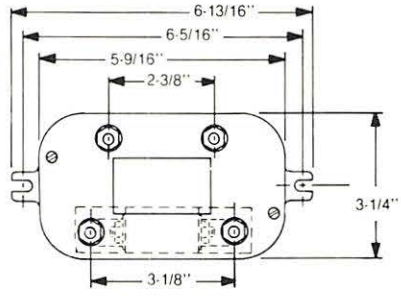
Notes: MODELS SP17-1A, SP18-1A, SP19-1A, SP24-1A, SP17-1B, SP18-1B, SP19-1B, SP24-1B surge protection networks either include an 18 volt tranzorb diode (part number 010905-1X), or a 32 volt tranzorb diode (part number 010905-5X).

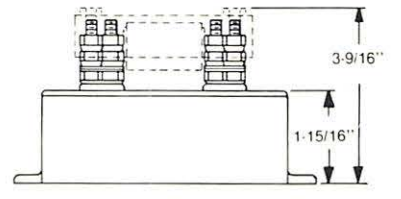
MODELS SP17-2A, SP18-2A, SP19-2A, SP24-2A surge protection networks include either an 18 volt tranzorb diode (part number 010905-1X), or a 32 volt tranzorb diode (part number 010905-5X). All of the above are equipped with a heavy duty equalizer (part number 022700-1X).

AC LINE PROTECTORS

MODELS: SP20-1A SP20-1B SP20-2A SP20-3A



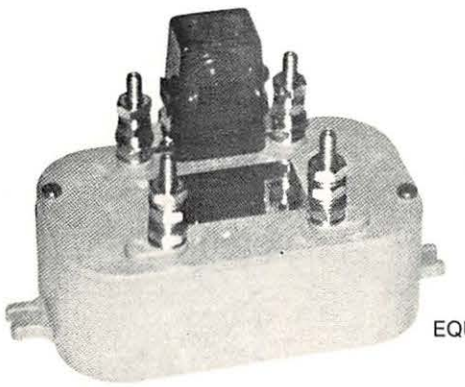


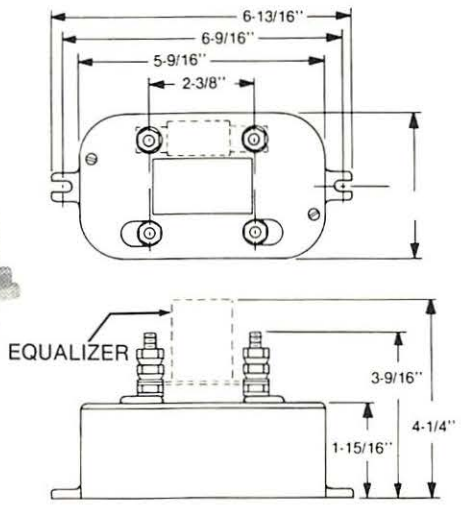


Note: The Model SP20-2A equipped with an AC line protector (part number 022701-1X). The Model SP20-3A is supplied with two AC line protectors (part number 022701-2X), which mount separately from unit.

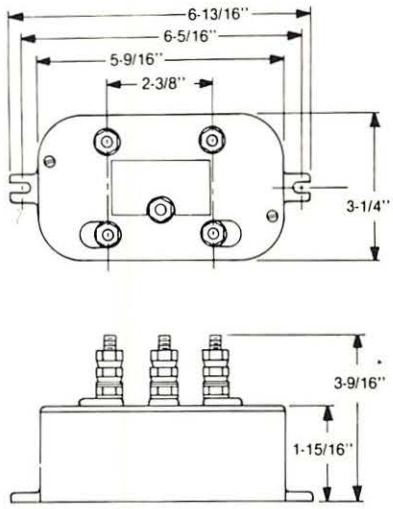
TRACK CIRCUIT PROTECTORS

MODELS: SP26-2 SP26-2-50
SP26-6 SP15-2





MODEL: SP27-2



Notes: The Model SP15-2 is for use where no DC voltage is present on track current. Where DC is present the SP26 series must be used.

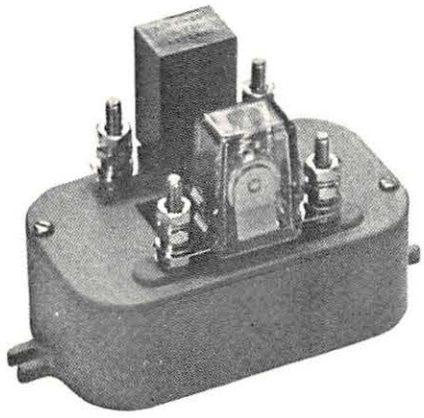
The Model SP26-6 is equipped with a heavy duty equalizer (part number 022700-1X). Both the Models SP26-2 and SP26-6 have a trigger voltage of 30 volts, whereas the SP26-2-50 has a trigger voltage of 50 volts.

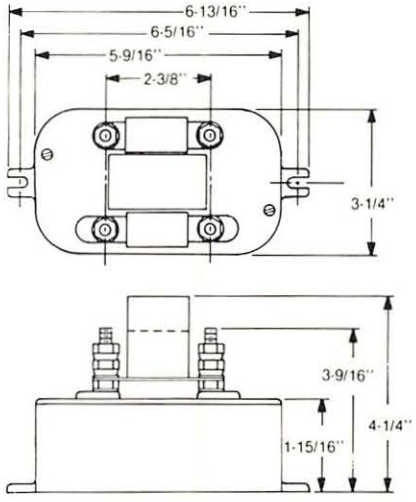
The Model SP27-2 is designed for the Model 350 Motion Sensor, the Model 400 Grade Crossing Predictor applications.

The Model SP27-2 has a trigger voltage of 35 volts.

CODE LINE PROTECTORS

MODELS: SP21-1 SP21-2 SP21-3 SP21-4





Note: The Models SP21-2, SP21-3, SP21-4 are equipped with the Model SSP11 protector. SSP voltage is determined by code line voltage and should be 1.5 X code line voltage.

The SP21-3 is also equipped with the Model 485-28 Clearview® arrester (part number 022485-28X) and the SP21-4 is also equipped with the Model 485-50 Clearcomm arrester (part number 022485-50X).

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Model Number	Maximum Voltage	Equipped With*	Maximum Current in Amperes	Resistance Per Line in Ohms	Inductance Per Line in Microhenries	Part Number
Battery Line Protectors						
SP17-1A	18 VDC	b	1.5	1.1	550	010804-AX
SP17-1B	32 VDC	c	1.5	1.1	550	010804-BX
SP18-1A	18 VDC	b	5	.35	185	010805-AX
SP18-1B	32 VDC	c	5	.35	185	010805-BX
SP19-1A	18 VDC	b	10	.02	18	010806-AX
SP19-1B	32 VDC	c	10	.02	18	010806-BX
SP24-1A	18 VDC	b	25	.006	8	010811-4AX
SP24-1B	32 VDC	c	25	.006	8	010811-4BX
SP17-2A	18 VDC	b, d	1.5	1.1	550	010804-5AX
SP18-2A	18 VDC	b, d	5	.35	185	010805-4AX
SP19-2A	18 VDC	b, d	10	.02	18	010806-3AX
SP24-2A	18 VDC	b, d	25	.006	8	010811-5AX
AC Line Protectors						
SP20-1A	115 VAC	a	20	.01	18	010807-AX
SP20-1B	230 VAC	a	20	.01	18	010807-BX
SP20-2A	115 VAC	e	20	.01	18	010807-6AX
SP20-3A	230 VAC	e	20	.01	18	010807-7AX
Code Line Protectors						
SP21-1	400 VDC	a	20	.01	18	010808-X
SP21-2	Refer to (f)	f	20	.01	18	010808-ABX
SP21-3	Refer to (f)	f, g	20	.01	18	010808-ABX
SP21-4	Refer to (f)	f, h	20	.01	18	010808-ABX
Track Circuit Protectors						
SSP15-1†	.5 VDC	I	20	.01	18	010802-X
SSP15-2†	.5 VDC	D, I	20	.01	18	010802-14X
SP26-2†	5 VDC	a	25	.006	8	010814-X
SP26-2-50‡	5 VDC	a	25	.006	8	010814-7X
SP26-6†	5 VDC	d	25	.006	8	010814-6X
SP27-2†	5 VDC	a	25	.066	8	010819-X

*Units are supplied with:
(a) Unit only
(b) 18 Volt transzorb diode, part number 010905-1X
(c) 32 Volt transzorb diode, part number 010905-5X
(d) Equalizer Assembly, part number 022700-1X
(e) Line Protector, part number 022701-1X
(f) SSP II Protector specify voltage. To be 1.5 X code line voltage.
(g) Clearview® Arrester, part number 022485-28X
(h) Clear-Comm Arrester, part number 022485-50X
(i) SSP-30, part number 010800-X

†Has a trigger voltage of 30 Volts.
‡Has a trigger voltage of 50 Volts.

SOLID STATE PROTECTORS

The Solid State Protector is a shunting device designed to trigger at a specified voltage to provide desired protection to solid state equipment. It is applied in conjunction with the surge protection networks, arresters, or equalizers. It is made in an encapsulated assembly for application at the equipment to be protected. It has terminal lugs which mount directly on 2-3/8 inch centers. It is available either as a single unit, or mounted on bakelite terminal base.

Maximum steady state voltage (DC) for the SSP-30 is 0.5V as SSP will "clamp" on higher voltages after triggering. For DC Voltage up to 5.0V, the SSP-11 series must be used.

ORDERING INFORMATION

To Order: Specify Trigger Voltage and Part Number.

Model Number	Trigger Voltage	Part Number	
		Single Unit	Mounted on Base
SSP-30	30	010800-X	010800-5X
SSP11-20	20	010817-X	010818-X
SSP11-30	30	010817-1X	010818-1X
SSP11-40	40	010817-2X	010808-2X
SSP11-50	50	010817-3X	010818-3X
SSP11-100	100	010817-4X	010818-4X
SSP11-200	200	010817-5X	010818-5X
SSP11-300	300	010817-6X	010818-6X
SSP11-400	400	010817-7X	010818-7X

GAS SURGE ARRESTERS

A series of gas surge arresters provide low cost surge suppression. These rare gas discharge units are provided in several lower breakdown ratings than primary arresters. They should be used where surge levels are modest or as a backup to primary type (Clearview, Heavy Duty, Equalizer) Arresters.

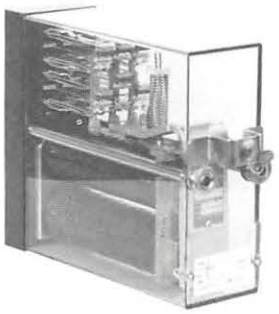
ORDERING INFORMATION

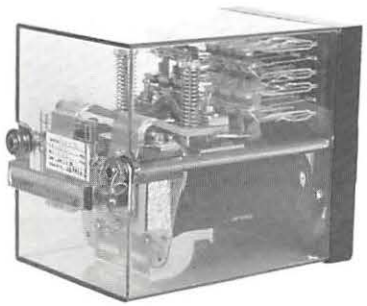
To Order: Specify Description and Part Number.

Description	Part Number
90 Volt Gas Surge Arrester Assy.	022999-90X
230 Volt Gas Surge Arrester Assy.	022999-230X
350 Volt Gas Surge Arrester Assy.	022999-350X
470 Volt Gas Surge Arrester Assy.	022999-470X
600 Volt Gas Surge Arrester Assy.	022999-600X
800 Volt Gas Surge Arrester Assy.	022999-800X

Safetran

TYPE ST1 AND ST2 VITAL PLUG-IN RELAYS





- SIZE 1 AND SIZE 2
- READILY MOUNTS TO EXISTING SOCKETS
- ALL FERROUS METAL PARTS ARE NICKEL PLATED
- MEETS OR EXCEEDS APPLICABLE AAR RECOMMENDED PRACTICES

Safetran Type ST1 and ST2 Vital Circuit Signal Relays are compact plug-in circuit switching elements housed within a clear plastic case for use in modern railway systems. These relays incorporate the required control characteristics as well as operating security for this application.

Type ST1 and ST2 relays fit into size 1 and 2 sockets already in common use. These relays are interchangeable with existing types of relays as well. Each relay carries a registration plate unique to that specific type. Sockets have like indexing pins to ensure insertion of the proper relay for each circuit function.

All contact and coil connections are brought out through the base of the relay as spring prongs. The socket has wedge shaped plug insulators with flat metal terminals on both the upper and lower surfaces. Relays are guided into the socket by two rods so that each pair of prongs engage their respective socket terminals, making a firm, low resistance contact. The socket terminals are available in either the solder or crimp types. Terminals are easily removed from the back of the socket for making wiring changes without unplugging the relay.

Contact support springs are phosphor bronze, molded in phenolic blocks. Relays are provided with space for three such blocks. Normally open or front contacts are fine silver to silver impregnated carbon; normally closed or back contacts are fine silver to fine silver. Regular, heavy duty, extra heavy duty; tungsten, and magnetic arc suppressed contacts are available. All ferrous metal parts of these relays are nickel plated. These relays have a highly efficient magnetic structure, making routine calibration quick and easy. A heavy armature provides for positive drop away. These relays meet or exceed all applicable AAR recommended practices.

TYPE ST PLUG-IN RELAYS ORDERING INFORMATION

NEUTRAL RELAY, REGULAR-RELEASE TYPE ST DIRECT CURRENT, LINE AND TRACK

TYPES ST1 AND ST2, DIRECT-CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Notes	Part Number
6FB	1.8	0.13	Track	400013
4FB-2F-1B	1.8	0.13	Track	400012
6FB	4	0.089	Track	400010
4FB-2F-1B	4	0.089	Track	400011
4FB-2F-1B	50	0.037	Line	400014
6FB	60	0.033	Line	400028
6FB	84	0.0195	Line	400001
4FB-2F-1B	100	0.0192	Line	400015
2FB	200	0.019	EHD Lamp Control	400021
4FB-2F-1B	350	0.0136	HD Contacts	400027
6FB	500	0.0121	Line	400000
4FB-2F-1B	500	0.0121	Line	400004
4FB-2F-1B	500	0.0121	HD Contacts	400020
4FB	500	0.0136	HD Contacts	400025
6FB	500	0.0165	EHD Contacts	400023
12FB	500	0.0152	Line	450000(ST2)
4FB-2F-1B	900	0.0084	Line	400003
4FB-2F-1B	900	0.0092	HD Contacts	400022
6FB	900	0.0084	Line	400017
4FB-2F-1B	1800	0.0047	Line	400002

NEUTRAL RELAY, SLOW-PICKUP TYPE ST1 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Pickup	Part Number
4FB-2F-1B	300	0.034	1.4 Sec	400101
6FB	220	0.041	1.35 Sec	400100

NEUTRAL RELAY, SLOW-RELEASE TYPE ST1 AND ST2 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Release	Part Number
2FB	24	0.023	.4 Sec	400221
2FB-4B	80	0.024	.1 Sec	400220
4FB-2F-1B	194	0.035	1 Sec	400211
6FB	194	0.035	1 Sec	400210
4FB	194	0.033	3 Sec @ 12V	400200
4FB-2F-1B	194	0.0335	2.8 Sec @ 10V	400212
12FB	260	0.0231	.825 - 1.1 Sec @ 10V	450200(ST2)
2FB	460	0.014	3.0 Sec @ 9V	400213

NEUTRAL RELAY, SLOW-PICKUP AND SLOW-RELEASE TYPE ST1 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Release	Part Number
4FB-2F-1B	194	0.046	1.1 Sec	400400

BIASED RELAY, SLOW-RELEASE TYPE ST1 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Release	Part Number
6FB	194	0.026	1 Sec	400530

BIASED RELAY, SLOW-PICKUP TYPE ST1 AND ST2 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Release	Part Number
6FB	800	0.0119	1.25 Sec	400540
8FB-4F-2B	800	0.0135	1.25 to 1.5 Sec	450300(ST2)

LIGHT-OUT NEUTRAL RELAY TYPE ST1, AC OR DC

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	For Use With Lamps		Maximum Working Amps AC or DC	Part Number
		Volts	Watts		
4FB	.24 w/400300 Rectifier	10	5+3.5	0.68	400303-X
4FB	.24	10	5+3.5	0.68	400303
4FB	450/.069 w/400300 Rectifier	10	18+3.5	.0115/1.68	400302-X
4FB	450/.069	10	18+3.5	.0115/1.68	400302
4FB	450/.12 2/400300 Rectifier	12-16	21 (C.P.)	.115/.833	400300-X
4FB	450/.12	12-16	21 (C.P.)	.115/.833	400300
6FB	450/.2 w/400300 Rectifier	10	10	.016/.840	400301-X
6FB	450/.2	10	10	.016/.840	400301

NOTE: Part No. with -X means with Rectifier Assembly. For Rectifier Assemblies see page I-1-9.

SWITCH-CONTROL RELAY TYPE ST1 DIRECT CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Switch Machine Operating Voltage	Maximum Pickup & Working Amperes	Notes	Part Number
2F-2B	500	Low or High (20) (110)	0.019	Biased Neutral EHD Contacts	400520
4FB	500	Low	0.0136	Neutral EHD Contacts	400025

SWITCH-OVERLOAD NEUTRAL RELAY TYPE ST1 DIRECT CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Switch Machine Operating Voltage	Overload Rating Amperes	Part Number
2B	.068/1225	High	12	400600
2CBO*	.064/135	Low	18	400601
2CBO*	.068/220	High	11.5	400602
2CBO*	.125/135	High	7.5	400604
2CBO*	.064/135	High	12	400605

*Close Before Open

BIASED-NEUTRAL RELAY TYPE ST1 AND ST2 DIRECT CURRENT

To Order: Specify Contacts, Resistance, and Part Number.
Note: This relay is magnetically biased to pickup on one polarity only.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Notes	Part Number
4FB	0.5	0.356	Track	400511**+
5F-4B	0.5	0.365	Track	400515**+
5F-4B	0.5	0.374	Track	400508**+
4FB-2F-1B	2	0.158	Track	400510**+
6FB	2	0.13	Track	400512**+
4FB	2	0.185	Track	400518
5F-4B	4	0.126	Track	400507
6FB	63	0.0305	Series Line	400501
4FB-2F-1B	100	0.626	Line	400504
8FB-4F-2B	350	0.0189	Line	450501 (ST2)
12FB	350	0.0189	Line	450500 (ST2)
6FB	500	0.0121	HD Contacts	400505
6FB	500	0.0121	Line	400500
4FB-2F-1B	500	0.0121	Line	400502
4FB-2F-1B	500	0.0121	HD Contacts	400506
6FB	800	0.0088	Line	400516
8FB-4F-2B	800	0.011	Line	450502 (ST2)
2FB-4F-2B	1000	0.0088	Line	400503
4FB	2000	0.006	Track	400517+

Notes: ** Two 1.0 Ohm Coils Connected in Multiple for 0.5 0hm and Series for 2.0 Ohms
+ High DA/PU Ratio Track Relay

FLASHER RELAY FOR HIGHWAY CROSSING WARNING AND FLASHING SIGNAL ASPECTS TYPE ST1 DIRECT CURRENT WITH SOLID STATE FLASHER UNIT

To Order: Specify Description and Part Number.

Contacts	Nominal System Voltage	Relay Coil Nominal Resistance Ohms	Flashing Rate	Part Number
4FB	8-16	60		400700
4FB	8-16	60 w/400700-1X Flasher Module	40-45 FPM	400700-X
4FB	8-16	60 w/400700-8X Flasher Module	56-64 FPM	400700-7X

POWER-TRANSFER NEUTRAL RELAY TYPE ST1

To Order: Specify Contacts, Voltage, and Part Number.

Contacts	Rated Voltage AC	Nominal Resistance Each Side - Ohms	Part Number
6FB	10	100/100 (Metal to Metal Contacts)	400800
6FB	10	100/100 w/400800-1X Rectifier Assy	400800-X
6FB	10	100/100 (Metal to Carbon Contacts)	400801
6FB	10	100/100 w/400800-1X Rectifier Assy	400801-X
6FB	12	100/100 (Metal to Metal Contacts)	400802
6FB	12	100/100 w/400800-1X Rectifier Assy	400802-X

POLARIZED RELAY TYPE ST1 & ST2, DIRECT-CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Size	Contacts	Normal & Reverse Operating Ampere	Nominal Resistance Ohms	Maximum Polar Pickup and Working Amperes	Part Number
2	6NR	-------	500	0.0065	450900 (ST2)
2	4FB-4NR	-------	500	0.0049	450901 (ST2)
2	4NR-2FB-2F (HD)	-------	125/.14	0.0116	450902 (ST2)
1	2NR	.010 to .012	520	-------	400903 (ST1)

MAGNETIC-STICK RELAY TYPE ST1, DIRECT-CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Normal Reverse Working Amperes (Double Coil Operation)	Part Number
4NR, Carbon to Metal	500	0.011	400900
2NR, Silver Platinum	26 x 26	0.021	400901

CODE RESPONSIVE RELAY TYPE ST1, DIRECT-CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Nominal System Voltage	Contacts	Nominal Resistance Ohms	Notes	Part Number
12	2FB Front - Silver & Platinum Back - Tungsten	200	Line Code Repeater	400950
10	4FB Tungsten	80	Line Code Repeater	400951
10	2NR Silver & Platinum	22-22	Polar-Stick Relay	400952
12	2FB Front - Silver/Platinum Back - Tungsten	80	Line Code Repeater	400953
10	4FB Silver & Platinum	80	Line Code Repeater	400954

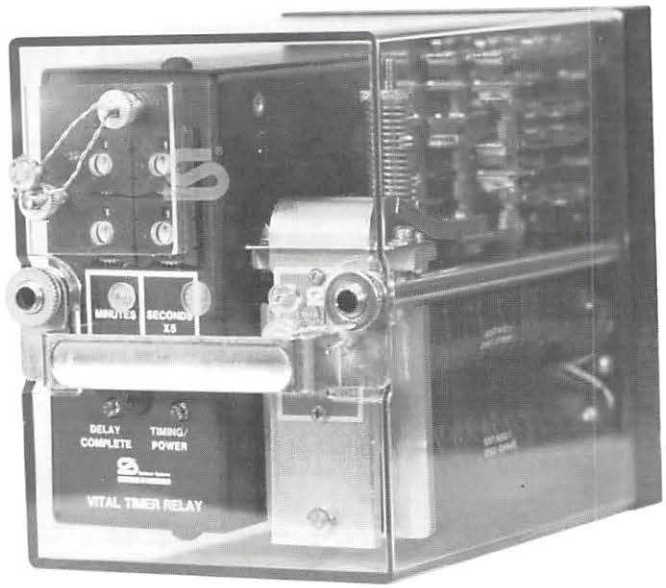
Note: Silver-Platinum contacts for 30 volts or less
Tungsten contacts for over 30 volts

VANE RELAY - A/C, TYPE ST2, TWO POSITION, TRACK RELAY

To Order: Specify Contacts, Resistance, and Part Number.

Contracts	Local Winding Volts	Track Winding Volts	Frequency (Hz)	Part Number
4F-4B	110/55	1.0/0.5	60	450992
4F-4B	110/55	2.0/1.0	100	450993
2F-2B	55	5.0	60	450994

VITAL TIMER RELAY



The Safetran ST 451000-X Vital Timer Relay is designed to provide a precise, preset pickup delay for time locking, electric switch lock releases and other vital timing applications for a nominal 12 volt system. It consists of a vital solid state electronic timer module mounted together with a Type ST neutral relay in a double-wide ST relay housing.

The electronic timer is adjustable in increments of five seconds, from 5 seconds minimum to 15 minutes, 55 seconds maximum. Timing starts upon application of power. At the end of the timing period, the relay will energize. The unit will respond only with input polarity as indicated.

The unit replaces most electromechanical vital timer relays and is plug compatible with a GRS A62-6276 timer relay.

The timer module consists of a digital electronic timer on two printed circuit boards in an aluminum housing. Timing is controlled by a high accuracy quartz crystal oscillator with an adjustable countdown divider to an accuracy of less than one second over the entire timing range. Switches protected by a removable front cover set the timing interval in increments of five seconds as indicated above. LED lamps are provided to indicate timing in progress and timing complete.

Timing commences when power is applied to the input terminals of the relay. If power remains on, the electronic module will energize the relay after the preset interval. If power is interrupted before completion of the timing cycle, the timer is instantaneously reset. The full timing interval will commence when the input terminals are reenergized.

Time is set by means of four screwdriver adjusted switches on the front of the relay located under a sealed clear cover. These are accessed by removing two #8 thrumbscrews and removing the cover.

SPECIFICATIONS

Nominal System Voltage	Input Current	Contacts	Time Range		Part Number
			Min	Max	
9.5-16	0.2 Amp	2FB-3F-2B	5 Sec	15 Min, 55 Sec	451000-X

TYPE ST PLUG-IN RELAYS ORDERING INFORMATION FOR COMPLETE ASSEMBLIES

To Order: Specify Description and Relay Number with Assembly Number.

Description	Relay Number	Assy Number
For all Relay Numbers except 400300-X, 400301-X, 400302-X, 400303-X, 400700-X, 400700-7X, 400800-X, 400801-X and 400802-X (These Numbers do not include rectifier or flasher units)		
w/Socket Only (Less Tabs)		-10X
w/Socket Only (Less Tabs) and Voltage Test Post Kit		-11X
w/Socket and 20-16 Crimp Type Tabs		-12X
w/Socket, Voltage Test Post Kit and 20-16 Crimp Type Tabs		-13X
w/Socket and Solder Type Tabs		-14X
w/Socket, Voltage Test Post Kit and Solder Type Tabs		-15X
w/Socket and 14-10 Crimp Type Tabs		-16X
w/Socket, Voltage Test Post Kit and 14-10 Crimp Type Tabs		-17X
For Relay Numbers 400300-X, 400301-X, 400302-X and 400303-X (These numbers include rectifier units)		
w/Socket Only (Less Tabs)		-100X
w/Socket Only (Less Tabs) and Voltage Test Post Kit		-110X
w/Socket and 20-16 Crimp Type Tabs		-120X
w/Socket, Voltage Test Post Kit and 20-16 Crimp Type Tabs		-130X
w/Socket and Solder Type Tabs		-140X
w/Socket, Voltage Test Post Kit and Solder Type Tabs		-150X
w/Socket and 14-10 Crimp Type Tabs		-160X
w/Socket, Voltage Test Post Kit and 14-10 Crimp Type Tabs		-170X
For Relay Numbers 400700-X 40-45 FPM & 400700-7X 50-65 FPM (These numbers include Flasher Unit)		
w/Socket Only (Less Tabs) 400700-X (40-45 FPM)		-100X
w/ Socket and 20-16 Crimp Tabs 400700-X (40-45 FPM)		-120X
w/Socket and Solder Type Tabs 400700-X (40-45 FPM)		-140X
w/Socket and 14-10 Crimp Tabs 400700-X (40-45 FPM)		-160X
w/Socket Only (Less Tabs) 400700-7X (50-56 FPM)		-107X
w/Socket and 20-16 Crimp Tabs 400700-7X (50-56 FPM)		-127X
w/Socket and Solder Type Tabs 400700-7X (50-56 FPM)		-147X
w/Socket and 14-10 Crimp Tabs 400700-7X (50-56 FPM)		-167X
For Relay Numbers 400800-X, 400801-X and 400802-X (These numbers include rectifier)		
w/Socket Only (Less Tabs)		-100X
w/Socket and 20-16 Crimp Type Tabs		-120X
w/Socket and Solder Type Tabs		-140X
w/Socket and 14-10 Crimp Type Tabs		-160X

Note: Current Test Post Kit is included with all relay sockets.

RELAY MODULES AND RECTIFIERS ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Transistor Rect Module for 400300 Relay, w/mounting hardware	400300-1X
Transistor Rect Module for 400301 Relay, w/mounting hardware	400300-1X
Transistor Rect Module for 400302 Relay, w/mounting hardware	400300-1X
Transistor Rect Module for 400303 Relay, w/mounting hardware	400300-1X
S-Pack Flasher Module for 400700 Relay, w/mounting hardware, 40-45 FPM	400700-1X
S-Pack Flasher Module for 400700 Relay, w/mounting hardware, 50-65 FPM	400700-8X
S-Pack Flasher Module for 400700 Relay, w/o mounting hardware 40-45 FPM	400700-5X
S-Pack Flasher Module for 400700 Relay, w/o mounting hardware 50-65 FPM	400700-18X
Rectifier Assembly for Relay 400800 and 400801, w/mounting hardware	400800-1X

TYPE ST1 AND ST2 RELAY COILS ORDERING INFORMATION

To Order: Specify Part Number and Coil Resistance.

Resistance Ohms	ST1 or ST2 Relay(s) Used On	Part Number
250	400000, 400004, 400020, 400023, 400025	420051-1X
2	400010, 400011	420051-2X
100	400021, 400800, 400801, 400802	420051-3X
450	400003, 400022, 400300, 400301, 400302	420051-4X
0.2	400301	420051-5X
0.12	400300	420051-6X
220	400100, 400602	420051-7X
194	400200, 400210, 400211, 400212, 400400	420051-8X
135	400601, 400604	420051-9X
1225	400600	420051-10X
0.064	400601	420051-11X
0.068	400600, 400602	420051-12X
60	400700	420051-13X
250	400500, 400502, 400505, 400520	420051-15X
400	400516	420051-16X
1	400510, 400511, 400512, 400515	420051-17X
31.5	400501	420051-18X
42	400001	420051-19X
900	400002	420051-20X
40	400220 (Top)	420051-21X
40	400220 (Bottom)	420051-22X
500	400503	420051-23X
0.9	400012, 400013	420051-24X
300	400101	420051-25X
50	400504	420051-26X
100	400021 (Bottom)	420051-28X
12	400221 (Top)	420051-29X
12	400221 (Bottom)	420051-30X
0.69	400302	420051-31X
460	400213	420051-32X
194	400530	420051-33X
800	*450300	420051-34X
800	400540	420051-35X
0.125	400604	420051-36X
250	*450000, 450900, 450901	420051-37X
260	*450200	420051-42X
175	*450500, 450501	420051-43X
62.5/.070	*450902	420051-44X
250	400900	420051-45X
26	400901	420051-46X
100	400950	420051-47X
40	400951	420051-48X
250	451000	420051-49X
400	*450502	420051-50X
1000	400517	420051-51X
0.67 (Local)	*450993-Vane	420051-56X
.4 (Track)	*450993-Vane	420051-57X
144 (Local)	*450992, 450994- Vane	420051-58X
5 (Track)	*450994- Vane	420051-59X
.524 (Track0	*450992- Vane	420051-60X
25	400014	420051-88X
22	400952	420051-89X

*ST2

CONTACT STACKS FOR ST1 AND ST2 RELAYS

To Order: Specify Description and Part Number.

Relay	Contact Stack Description	Part Number	Relay	Contact Stack Description	Part Number
400000	2FB	420052-1X	400502	2FB	420052 -1X
400001	2FB	-1X	400502	2F-1B	-2X
400002	2FB	-1X	400503	2FB	-1X
400002	2F-1B	-2X	400503	2F-1B	-2X
400003	2FB	-1X	400504	2FB	-1X
400003	2F-1B	-2X	400504	2F-1B	-2X
400004	2FB	-1X	400505	2FB (HD)	-3X
400004	2F-1B	-2X	400510	2FB	-1X
400010	2FB	-1X	400510	2F-1B	-2X
400011	2FB	-1X	400511	2FB	-1X
400011	2F-1B	-2X	400512	2FB	-1X
400012	2FB	-1X	400515	1F-2B	-8X
400012	2F-1B	-2X	400515	2FB	-1X
400013	2FB	-1X	400516	2FB	-1X
400014	2FB	-1X	400520	2F-1B (EHD)	-7X
400014	2F-1B	-2X	400530	2FB	-1X
400015	2FB	-1X	400540	2FB	-1X
400015	2F-1B	-2X	400600	2B	-10X
400017	2FB	-1X	400601	2 (CBO)	-9X
400020	2FB (HD)	-5X	400602	2 (CB0)	-9X
400020	2F-1B (HD)	-6X	400604	2 (CB0)	-9X
400021	2B (HD)	-12X	400700	2FB (FLASHER)	-4X
400022	2FB (HD)	-5X	400800	2FB (HD)	-3X
400022	2F-1B (HD)	-6X	400801	2FB (HD) (SIL-CARB)	-13X
400022	2FB (HD)	-3X	400802	2FB (HD)	-3X
400025	2FB (EHD)	-4X	400900	1NR	-24X
400100	2FB	-1X	400901	1NR (SIL.PLAT.)	-25X
400101	2FB	-1X	400951	1FB (TUNGSTEN)	-16X
400101	2F-1B	-2X	400952	1 NR (SIL. PLAT.)	-25X
400200	2FB	-1X	400953	2FB (SIL.-PLAT.)	-19X
400210	2FB	-1X	400953	2FB (TUNGSTEN)	-20X
400211	2FB	-1X	400954	2FB (SIL. PLAT.)	-26X
400211	2F-1B	-2X	*450000	2FB	-1X
400212	2FB	-1X	*450200	2FB	-1X
400212	2F-1B	-2X	*450300	2FB	-1X
400213	2FB	-1X	*450300	2F-1B	-2X
400220	1F-2B	-8X	*450500	2FB	-1X
400221	2FB	-1X	*450501	2FB	-1X
400300	2FB	-1X	*450501	2F-1B	-2X
400301	2FB	-1X	*450502	2FB	-1X
400302	2FB	-1X	*450502	2F-1B	-2X
400400	2FB	-1X	450992	1F-1B	-28X
400400	2F-1B	-2X	450993	1F-1B	-28X
400500	2FB	-1X	450994	1F-1B	-28X
400501	2FB	-1X	Blank Stack		-3

*ST2

TYPE ST1 AND ST2 RELAY SLUGS

To Order: Specify Description and Part Number.

Description	Dimensions	Part Number
Slug, Copper Nickel Plated	.562" ID x 2.453"	420051-2
Slug, Copper Nickel Plated	.578" ID x 4.968"	420051-3
Slug, Aluminum	1.628" ID x 2.453"	420051-4
Slug, Aluminum	.753" ID x 4.968"	420051-5
Slug, Copper	1.628" ID x 2.453"	420051-6
Slug, Copper Nickel Plated	.753" ID x 4.968"	420051-7
Slug, Copper	.753" ID x 1.065"	420051-8

MODEL ST1 & ST2 RELAY SOCKET ASSEMBLIES AND TERMINALS

INTRODUCTION

Safetran Type ST Plug-In Relay Sockets are designed for mounting of Model ST Relays, as well as other manufacturer's relays. These socket assemblies consist of a socket, two relay mounting guide rods, current (1) test terminal, and necessary mounting hardware. These sockets can be furnished with either solder- or crimp-type terminals.

ORDERING INFORMATION

Socket Assemblies

To Order: Specify Description and Part Number.

Description	Part Number	
	Single Socket	Double Socket
Relay Socket w/1 Test Post, Less Terminals	420000-40X	452000-40X
Above w/20-16 Crimp-Type Terminals	420000-41X	452000-41X
Above w/14-10 Crimp-Type Terminals	420000-43X	452000-43X
Above w/Solder-Type Terminals	420000-42X	452000-42X
Relay Socket w/1 Test Post, Voltage Test Post, Less Terminals	420000-75X	452000-75X
Above w/20-16 Crimp-Type Terminals	420000-76X	452000-76X
Above w/14-10 Crimp-Type Terminals	420000-78X	452000-78X
Above w/Solder-Type Terminals	420000-77X	452000-77X

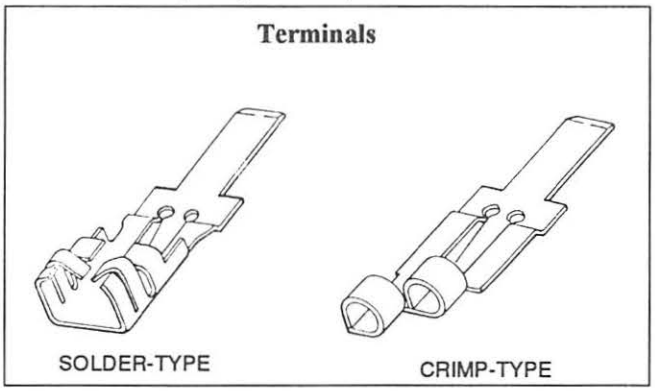
NOTE: 22 terminals supplied with single socket, 40 terminals supplied with double socket.

Terminals And Crimper

To Order: Specify Description and Part Number.

Crimper

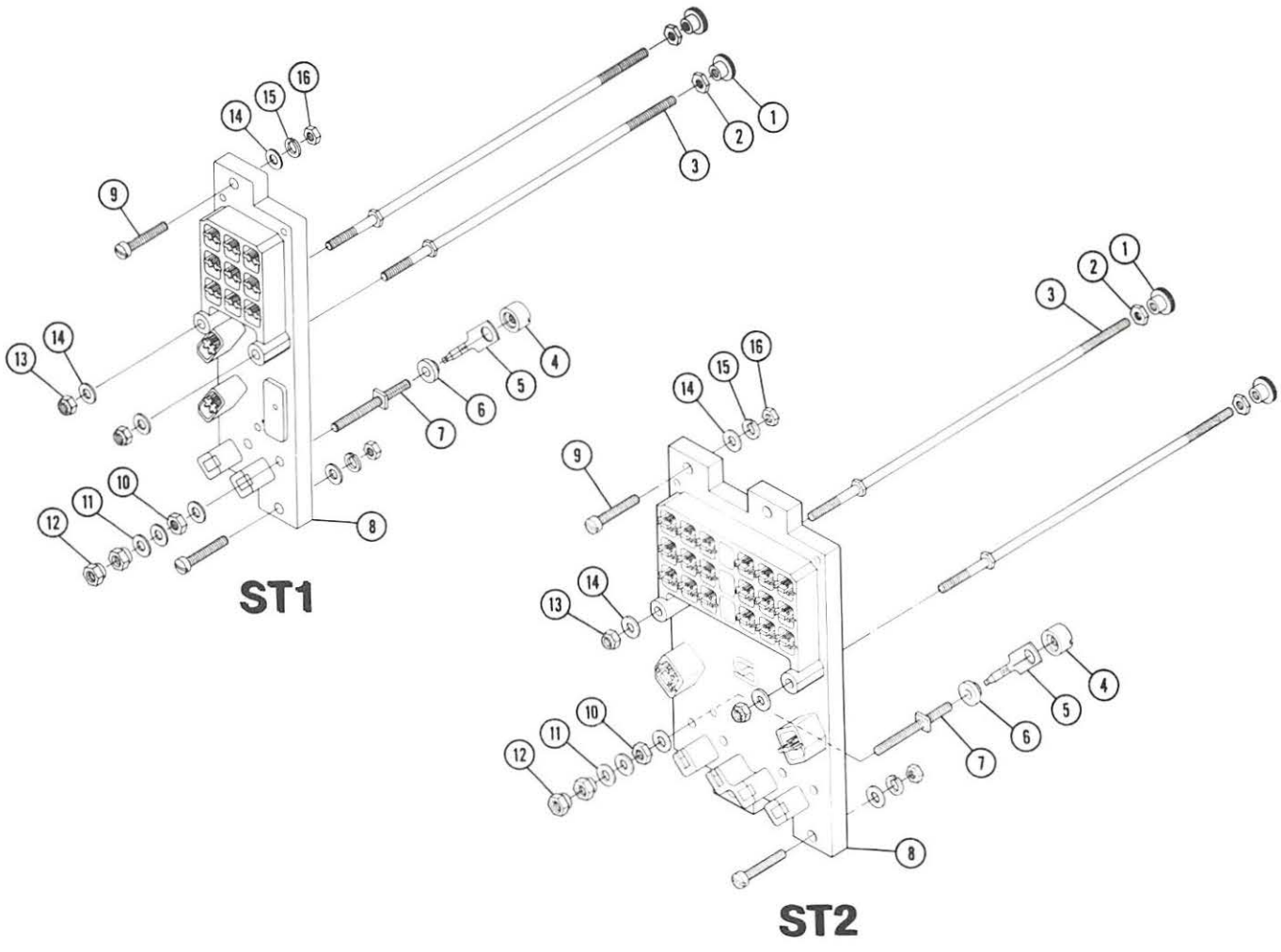
Terminals



Socket Insert

Description	Part Number
Terminal, Solder-Type for Sockets	420000-48
Terminal, Crimp-Type No. 16-20 AWG for Sockets	420000-49
Terminal, Crimp-Type No. 10-14 AWG for Sockets	420000-50
Socket Insert	420000-61
Crimper	420000-85

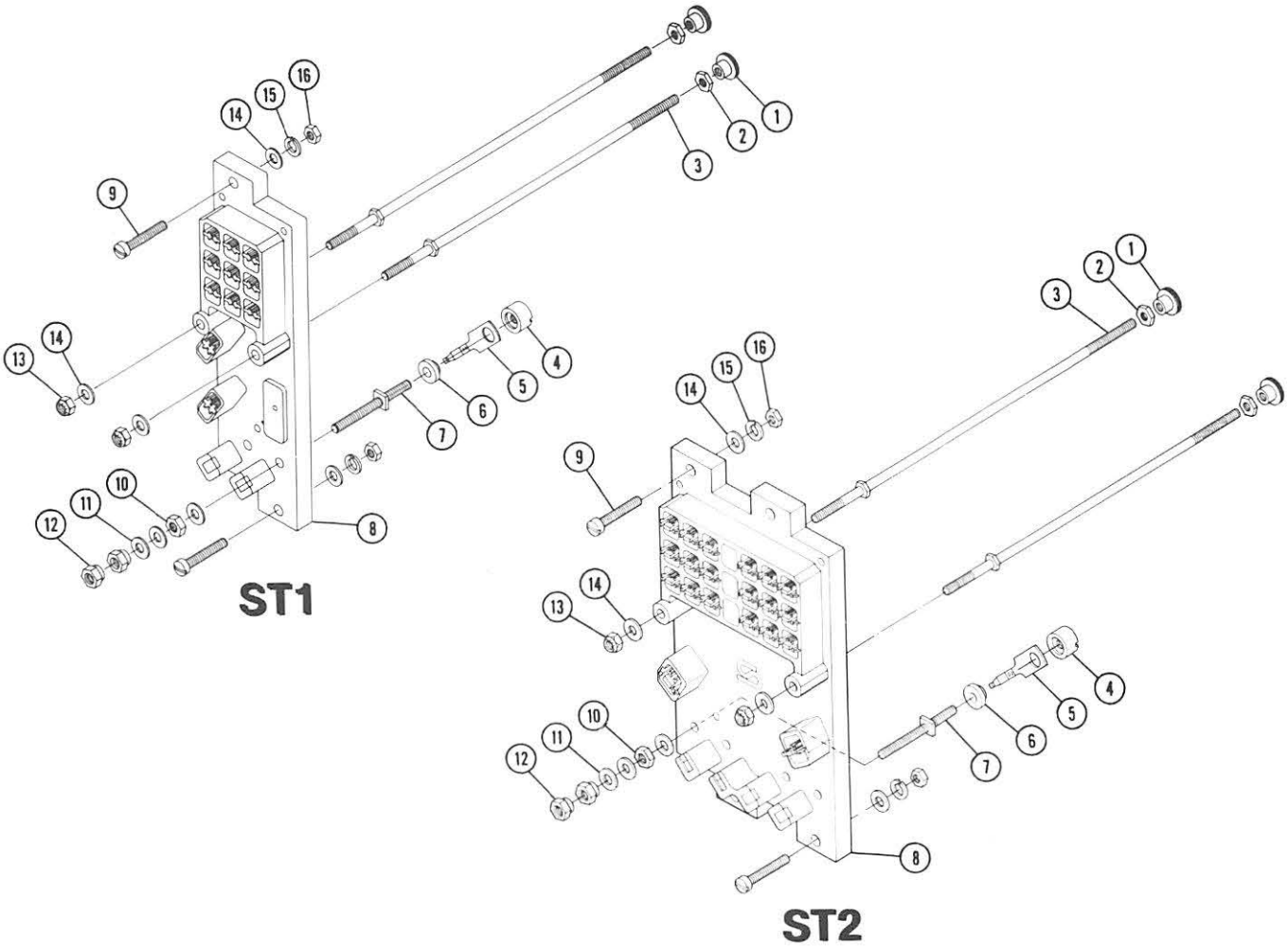
MODEL ST1 & ST2 RELAY SOCKETS REPLACEMENT PARTS



To Order: Specify Description and Part Number

Item Number	Description	Single		Double	
		Qty. Req'd	Part Number	Qty. Req'd	Part Number
1	Nut, Knurl	2	420000-67	2	420000-67
2	Nut, Hold Down Stud	2	420000-66	2	420000-66
3	Stud, Hold Down	2	420000-63	2	420000-63
4	Nut, Socket	1	420000-65	1	420000-65
5	Connector, Terminal	1	420000-64	1	420000-64
6	Bushing, Insulation	1	024620-12	1	024620-12
7	Post, Current Test	1	420000-55	1	420000-55
8	Socket Assy.	1	420000-60X	1	452000-60X
9	Machine Screw, 1/4"	2	420000-68	4	420000-68
10	Nut, Clamp	1	023832	1	023832
11	Washer, Beveled	3	023834	3	023834
12	Nut, Binding	2	023831	2	023831
13	Nut, Esna, 1/4"-28	2	420000-69	2	420000-69
14	Washer, Flat, 1/4"	4	420000-70	6	420000-70
15	Washer, Spring	2	420000-71	4	420000-71
16	Nut, Hex, 1/4"	2	420000-72	4	420000-72

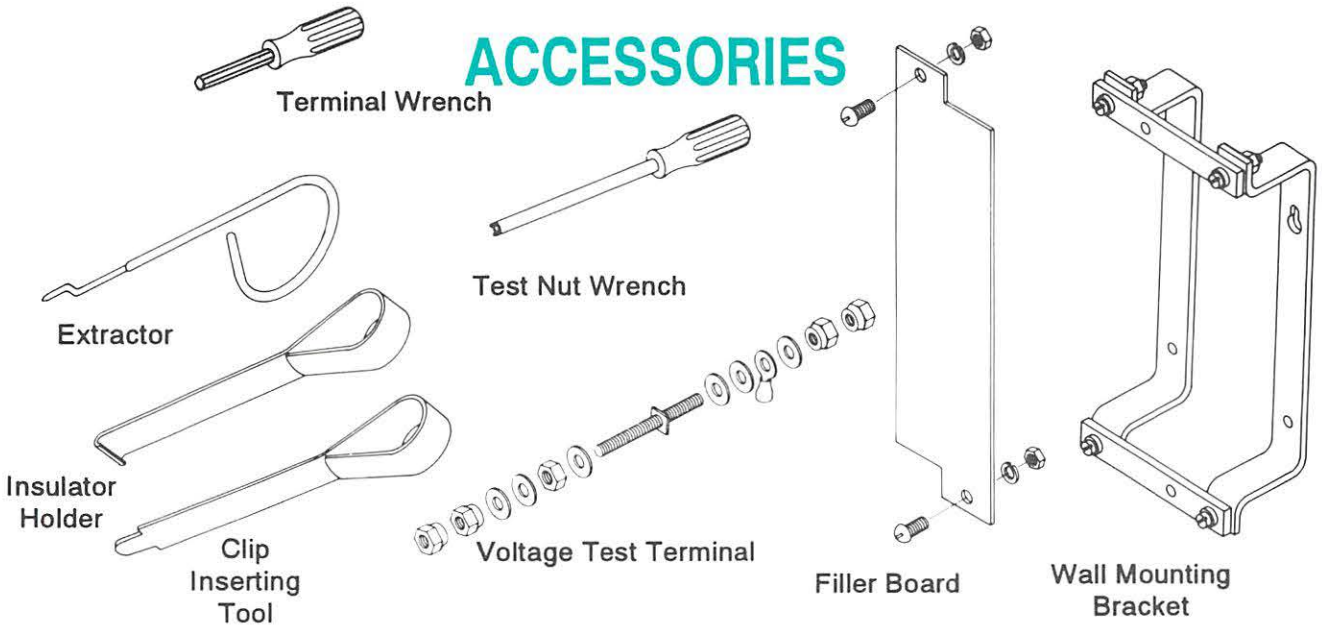
MODEL ST1 & ST2 RELAY SOCKETS REPLACEMENT PARTS



To Order: Specify Description and Part Number

Item Number	Description	Single		Double	
		Qty. Req'd	Part Number	Qty. Req'd	Part Number
1	Nut, Knurl	2	420000-67	2	420000-67
2	Nut, Hold Down Stud	2	420000-66	2	420000-66
3	Stud, Hold Down	2	420000-63	2	420000-63
4	Nut, Socket	1	420000-65	1	420000-65
5	Connector, Terminal	1	420000-64	1	420000-64
6	Bushing, Insulation	1	024620-12	1	024620-12
7	Post, Current Test	1	420000-55	1	420000-55
8	Socket Assy.	1	420000-60X	1	452000-60X
9	Machine Screw, 1/4"	2	420000-68	4	420000-68
10	Nut, Clamp	1	023832	1	023832
11	Washer, Beveled	3	023834	3	023834
12	Nut, Binding	2	023831	2	023831
13	Nut, Esna, 1/4"-28	2	420000-69	2	420000-69
14	Washer, Flat, 1/4"	4	420000-70	6	420000-70
15	Washer, Spring	2	420000-71	4	420000-71
16	Nut, Hex, 1/4"	2	420000-72	4	420000-72

ACCESSORIES



Available for use with the Type ST1 & ST2 plug-in relay sockets are a voltage test terminal, filler board, and wall mounting brackets.

The test terminal post consists of terminal post, crimp type test terminal, and necessary hardware.

The filler boards are for use in mounting terminals, rectifiers, diodes, etc., and are of aluminum construction.

The wall mounting brackets are for the mounting of relay sockets to the wall of instrument housings. These brackets, designed for 1 to 4 relay sockets, will also accommodate other manufacturers' sockets. These brackets alleviate the need to install large relay racks when installing only a few plug-in relays. Necessary hardware for mounting these brackets on the wall of instrument housing is provided.

The extractor is constructed of steel wire covered with insulating tubing. It is used for removing terminals and clips from Type ST1 & ST2 relay plugboards.

The insulator holder is for holding insulators in plugboards while inserting clips, and clip inserting tool is for inserting clips into engagement with insulators.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Wall Mounting Bracket for one ST1 Relay	420000-51X
Wall Mounting Bracket for two ST1 or one ST2 Relay	420000-52X
Wall Mounting Bracket for two ST1 and one ST2 Relays or two ST2 or four ST1 Relays	420000-53X
Shelf Mounting Bracket for one ST1 Relay	420000-54X
Shelf Mounting Bracket for two ST1 or ST2 Relay	420000-55X
Shelf Mounting Bracket for one ST1 and one ST2 Relay or three ST1 Relays	420000-56X
Filler Plate Kit	420000-58X
Voltage Test Post Kit	420000-46X
Terminal Wrench, 1/2 inch Hex Insulated	032619-3X
Test Nut Wrench	032619-22X
Extractor Tool	032619-25
Insulator Tool	032619-26
Clip Inserting Tool	032619-27X

ACCESSORIES (CONT.)

Relay Spring Adjusting Tool
5" long w/.064" slots

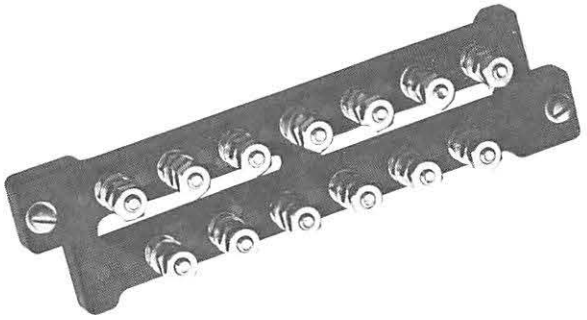
Relay Spring Adjusting Tool
5" long w/.035" slots

ORDERING INFORMATION

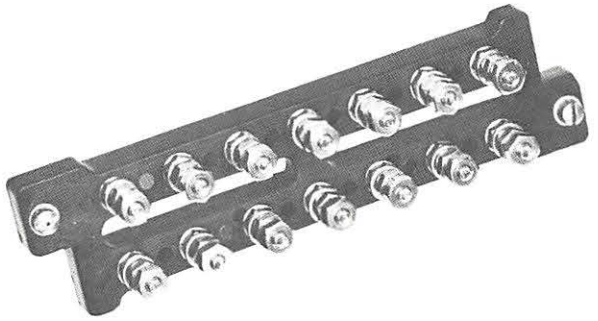
To Order: Specify Description and Part Number.

Description	Part Number
Relay Spring Adjudstment Kit	420000-93X

TERMINAL BLOCKS



13 Way
Terminal Block



14 Way
Terminal Block

Safetran 13 Way and 14 Way Black Phenolic Terminal Blocks provide convenient terminal mounting on existing relay racks. Beveled washer AAR# 14.1.11-8 and clamp nut AAR# 14.1.11-7 are assembled on posts. Balance of washers and binding nuts AAR# 14.1.11-6 are furnished in a separate plastic bag. For additional terminal block hardware, see page K-1-6.

ORDERING INFORMATION

To Order: Specify Description and Part Number

Description	Center to Center Dimension of Terminal Posts in Inches	Part Number
13 Way Terminal Block	1-1/6 Vertical Spacing 1-3/8 Horizontal Spacing	051883-26X1
14 Way Terminal Block	1-1/6 Vertical Spacing 1-1/4 Horizontal Spacing	051883-18X1

Section I

Safetran

RELAYS

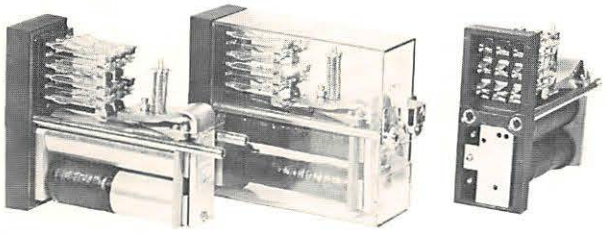
SECTION I

CONTENTS

Product	Subsection
Plug-in Relays	1
DC Flasher Relay	2
Neutral Relay	3
Power Transfer Relay	4

Safetran

TYPE ST VITAL PLUG-IN RELAYS



- READILY MOUNT TO EXISTING SOCKETS
- ALL FERROUS METAL PARTS ARE NICKEL PLATED
- MEETS OR EXCEEDS APPLICABLE AAR SPECIFICATIONS

Safetran Type ST Vital Circuit Signal Relays are compact plug-in circuit switching elements housed within a clear plastic case for use in modern railway systems. These relays incorporate the required control characteristics as well as operating security for this application.

Type ST relays fit into a common socket for quick and easy installation. They also fit existing sockets already in common use. These relays are interchangeable with existing types of relays as well. Each relay carries a registration plate unique to that specific type. Sockets have like indexing pins to ensure insertion of the proper relay for each circuit function.

All contact and coil connections are brought out through the base of the relay as spring prongs. The socket has wedge shaped plug insulators with flat metal terminals on both the upper and lower surfaces. Relays are guided into the socket by two rods so that each pair of prongs engage their respective socket terminals, making a firm, low resistance contact. The socket terminals are available in either the solder or crimp types. Terminals are easily removed from the back of the socket for making wiring changes without unplugging the relay.

Contact support springs are phosphor bronze, molded in phenolic blocks. Relays are provided with space for three such blocks. Normally open or front contacts are fine silver to silver impregnated carbon; normally closed or back contacts are fine silver to fine silver. Regular or heavy duty contacts are available. All ferrous metal parts of these relays are nickel plated. These relays have a highly efficient magnetic structure, making routine calibration quick and easy. A heavy armature provides for positive drop away.

These relays meet or exceed all applicable AAR specifications.

TYPE ST PLUG-IN RELAYS ORDERING INFORMATION

NEUTRAL RELAY, REGULAR-RELEASE TYPE ST DIRECT CURRENT, LINE AND TRACK

To Order: Specify contacts, resistance, and part number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Notes	Part Number
6FB	1.8	.013	Track	400013
4FB-2F-B	1.8	.13	Track	400012
6FB	4	.089	Track	400010
4FB-2F-1B	4	.089	Track	400011
6FB	84	.0196	Line	400001
2FB	210	.019	HD Lamp Control	400021
6FB	500	.0121	Line	400000
4FB-2F-1B	500	.0121	Line	400004
4FB-2F-1B	500	.0121	HD Contacts	400020
4FB-2F-1B	900	.0084	Line	400003
4FB-2F-1B	900	.0092	HD Contacts	400022
4FB-2F-1B	1800	.0047	Line	400002

NEUTRAL RELAY, SLOW-PICKUP TYPE ST DIRECT CURRENT, LINE

To Order: Specify contacts, resistance, and part number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Pickup	Part Number
4FB-2F-1B	300	.034	1.4 sec	400101
6FB	220	.041	1.35 sec	400100

FLASHER RELAY FOR HIGHWAY CROSSING WARNING AND FLASHING SIGNAL ASPECTS TYPE ST DIRECT CURRENT WITH SOLID STATE FLASHER UNIT

To Order: Specify Description and Part Number.

Contacts	Nominal System Voltage	Relay Coil Nominal Resistance Ohms	Flashing Rate	Part Number
4FB	8-16	60	40-45 FPM	400700
4FB	8-16	60 w/400700-1X flasher module	40-45 FPM	400700-X
4FB	8-16	60 w/400700-8X flasher module	50-64 FPM	400700-7X

POWER-TRANSFER NEUTRAL RELAY TYPE ST

To Order: Specify Contacts, Voltage and Part Number.

Contacts	Rated Voltage AC	Nominal Resistance Each Side — Ohms	Part Number
6FB	12	100/100	*400800
6FB	12	100/100 w/400800-1X Rectifier Assy.	400800-X
6FB	10	100/100	*400801
6FB	10	100/100 w/400800-1X Rectifier Assy.	400801-X
6FB	10	100/100	*400802
6FB	10	100/100 w/400800-1X Rectifier Assy.	400802-X

Note: *400800 and 400802 relays have metal to metal contacts.
400801 relay has metal to carbon contacts.

TYPE ST PLUG-IN RELAYS ORDERING INFORMATION FOR COMPLETE ASSEMBLIES

To Order: Specify description and relay number with assembly number.

Description	Relay Number	Assy. Number
For all Relay Numbers except 400300-X, 400301-X, 400700-X, 400800-X, 400801-X and 400802-X (These numbers do *not* include rectifier or flasher units)		
w/Socket Only (Less Tabs)		-10X
w/Socket Only (Less Tabs) and Voltage Test Post Kit		-11X
w/Socket and 20-16 Crimp Type Tabs		-12X
w/Socket, Voltage Test Post Kit and 20-16 Crimp Type Tabs		-13X
w/Socket and Solder Type Tabs		-14X
w/Socket, Voltage Test Post Kit and Solder Type Tabs		-15X
w/Socket and 14-10 Crimp Type Tabs		-16X
w/Socket, Voltage Test Post Kit and 14-10 Crimp Type Tabs		-17X
For Relay Numbers 400300-X and 400301-X (These numbers include rectifier units)		
w/Socket Only (Less Tabs)		-100X
w/Socket Only (Less Tabs) and Voltage Test Post Kit		-110X
w/Socket and 20-16 Crimp Type Tabs		-120X
w/Socket, Voltage Test Post Kit and 20-16 Crimp Type Tabs		-130X
w/Socket and Solder Type Tabs		-140X
w/Socket, Voltage Test Post Kit and Solder Type Tabs		-150X
w/Socket and 14-10 Crimp Type Tabs		-160X
w/Socket, Voltage Test Post Kit and 14-10 Crimp Type Tabs		-170X
For Relay Numbers 400700-X and 400800-X (These numbers include rectifier or flasher unit)		
w/Socket Only (Less Tabs)		-100X
w/Socket and 20-16 Crimp Type Tabs		-120X
w/Socket and Solder Type Tabs		-140X
w/Socket and 14-10 Crimp Type Tabs		-160X

NOTE: Current Test Post Kit is included with all relay sockets

RELAY MODULES AND RECTIFIERS ORDERING INFORMATION

To Order: Specify description and part number.

Description	Part Number
Transistor Rect Module for 400302 Relay, w/mounting hardware	400300-1X
Transistor Rect Module for 400300 Relay, w/mounting hardware	400300-1X
Transistor Rect Module for 400301 Relay, w/mounting hardware	400300-1X
S-Pack Flasher Module for 400700 Relay, w/mounting hardware, 40-45 FPM	400700-1X
S-Pack Flasher Module for 400700 Relay, w/mounting hardware, 50-65 FPM	400700-8X
Rectifier Assembly for Relay 400800 and 400801, w/mounting hardware	400800-1X

TYPE ST RELAY COILS ORDERING INFORMATION

To Order: Specify part number and coil resistance.

Resistance Ohms	ST Relays(s) Used On	Part Number
250	400000, 400004, and 400020	420051-1X
2	400010, 400011	420051-2X
100	400800	420051-3X
450	400003, 400300 and 400301	420051-4X
.2	400301	420051-5X
.12	400300	420051-6X
220	400100	420051-7X
194	400200, 400210, 400211, and 400400	420051-8X
135	400601	420051-9X
1225	400600	420051-10X
.064	400601	420051-11X
.068	400600	420051-12X
60	400700	420051-13X
250	400500, 400502, and 400520	420051-15X
1	400510	420051-17X
31.5	400501	420051-18X
42	400001	420051-19X
900	400002	420051-20X
40	400220	420051-21X
500	400503	420051-23X
.9	400012	420051-24X
300	400101	420051-25X
50	400504	420051-26X
220	400602	420051-27X

TYPE ST RELAY SLUGS ORDERING INFORMATION

To Order: Specify description and part number.

Description	Dimensions	Part Number
Slug, Copper Nickel Plated	.562-9/16" ID x 2.453"	420051-2
Slug, Copper Nickel Plated	.578" ID x 4.968"	420051-3
Slug, Alum.	1.628" ID x 2.453"	420051-4
Slug, Alum.	.753" ID x 4.968"	420051-5
Slug, Copper	1.628" ID x 2.453"	420051-6
Slug, Copper Nickel Plated	.753" ID x 4.968"	420051-7
Slug, Copper	.736" ID x 1.065"	420051-9

TYPE ST RELAY SOCKETS

Safetran Type ST Plug-in Relay Sockets are designed for mounting of Model ST relays as well as other manufacturers' relays. These socket assemblies consist of socket, two relay mounting guide rods, current (I) test terminal, and necessary mounting hardware. These sockets can be furnished with either solder or crimp type terminals.

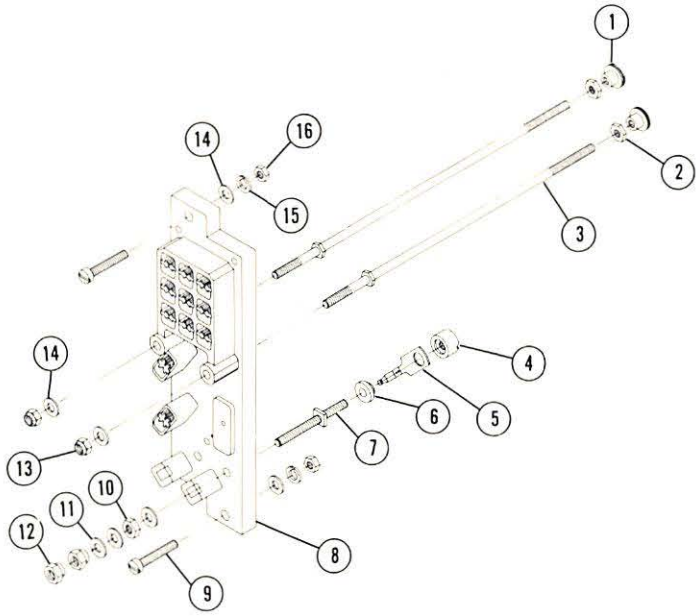
ORDERING INFORMATION

To Order: Specify description and part number.

Description	Part Number
Relay Socket w/I Test Post, less tabs	420000-40X
Above w/20-16 Crimp Tabs	420000-41X
Above w/14/10 Crimp Tabs	420000-43X
Above w/Solder Type Tabs	420000-42X
Relay Socket w/I Test Post, Voltage Test Post, Less Tabs	420000-75X
Above w/20-16 Crimp Tabs	420000-76X
Above w/14-10 Crimp Tabs	420000-78X
Above w/Solder Type Tabs	420000-77X

MODEL ST RELAY SOCKET

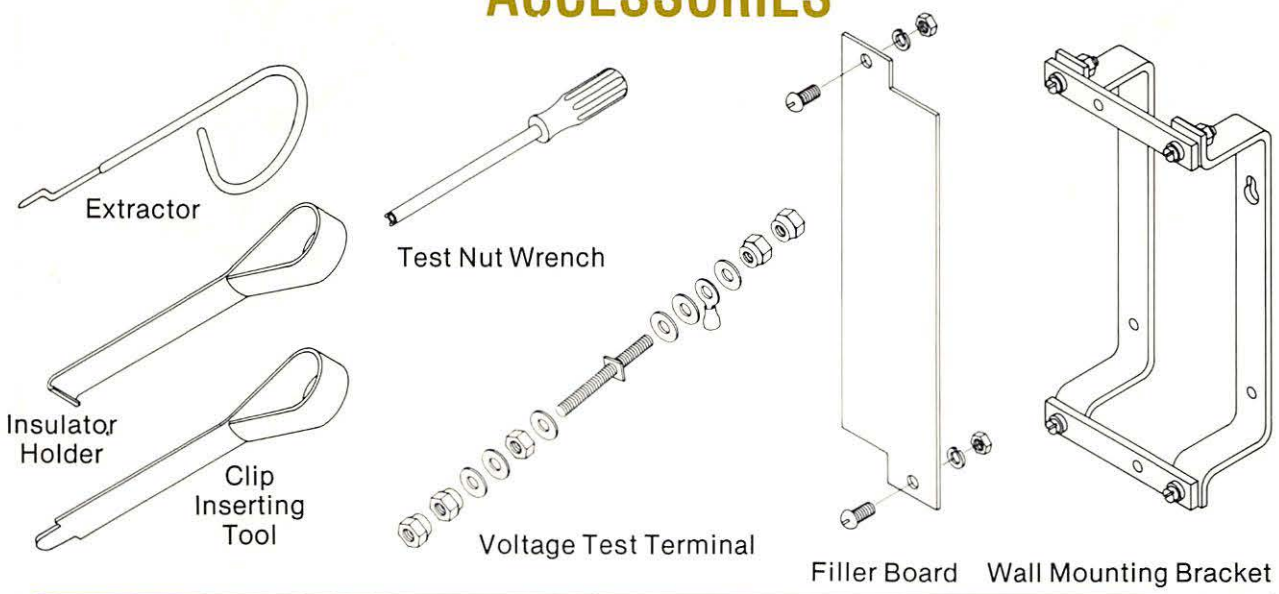
REPLACEMENT PARTS



To Order: Specify description and part number.

Item No.	Description	Qty.	Part Number
1	Nut, Knurl	2	420000-67
2	Nut, Hold Down Stud	2	420000-66
3	Stud, Hold Down	2	420000-63
4	Nut, Socket	1	420000-65
5	Connector, Terminal	1	420000-64
6	Bushing, Insulation	1	024620-12
7	Post, Current Test	1	420000-55
8	Socket Assy.	1	420000-60X
9	Machine Screw 1/4"	2	420000-68
10	Nut, Clamp	1	023832
11	Washer Beveled	3	023834
12	Nut, Binding	2	023831
13	Nut, Esna, 1/4" - 28	2	420000-69
14	Washer, Flat, 1/4"	4	420000-70
15	Washer, Spring	2	420000-71
16	Nut, Hex, 1/4"		420000-72

ACCESSORIES



Available for use with the Type ST plug-in relay sockets are a voltage test terminal, filler board, and wall mounting brackets.

The test terminal post consists of terminal post, crimp type test terminal, and necessary hardware.

The filler boards are for use in mounting terminals, rectifiers, diodes, ect., and are of aluminum construction.

The wall mounting brackets are for the mounting of relay sockets to the wall of instrument housings. These brackets, designed for 1 to 4 relay sockets, will also accommodate other manufacturers' sockets. These brackets alleviate the need to install large relay racks when installing only a few plug-in relays. Necessary hardware for mounting these brackets on the walls of instrument housings is provided.

The extractor is constructed of steel wire covered with insulating tubing. It is used for removing terminals and clips from Type ST relay plugboards.

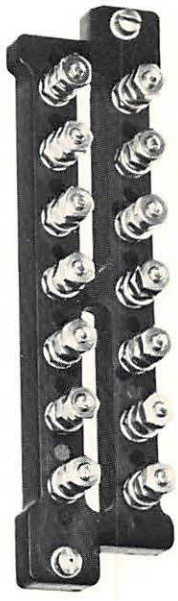
The insulator holder is for holding insulators in plugboards while inserting clips, and the clip inserting tool is for inserting clips into engagement with insulators.

ORDERING INFORMATION

To Order: Specify description and part number.

Description	Part Number
Wall Mounting Bracket, 1 Relay	420000-51X
Wall Mounting Bracket, 2 Relays	420000-52X
Wall Mounting Bracket, 4 Relays	420000-53X
Shelf Mounting Bracket, 1 Relay	420000-54X
Shelf Mounting Bracket, 2 Relays	420000-55X
Shelf Mounting Bracket, 3 Relays	420000-56X
Filler Plate Kit	420000-58X
Voltage Test Post Kit	420000-46X
Cover Assembly	420050-2X
Relay Repair Kit	420050-62X
Test Nut Wrench	032619-22X
Extractor	032619-25
Insulator Holder	032619-26
Clip Inserting Tool	032619-27

13 Way
Terminal Block



14 Way
Terminal Block

Safetran 13 Way and 14 Way Black Phenolic Terminal Blocks provide convenient terminal mounting on existing relay racks. For ordering information for terminal block hardware, see pg. K-1-6.

ORDERING INFORMATION

To Order: Specify description and part number.

Description	Center to Center Dimension of Terminal Posts in Inches	Part Number
13 Way Terminal Block	1-1/6 Vertical Spacing 1-3/8 Horizontal Spacing	051883-26
14 Way Terminal Block	1-1/6 Vertical Spacing 1-1/4 Horizontal Spacing	051883-18

SOLID STATE VITAL TIMER

- VARIETY OF VITAL TIMING APPLICATIONS
- 0 TO 19 MINUTES, 50 SECOND RANGE
- SELF OR RELAY RACK MOUNTING

The Solid State Vital Timer, 72210, is an electronic timer for vital timing applications such as signal time locking, electric switch lock time releases, and detector track circuit loss-of-shunt circuits. Timing range is from 0 to 19 minutes and 50 seconds in 10-second increments.

The circuitry is mounted on printed circuit modules which plug into the metal housing designed to be mounted in the space occupied by two Safetran ST Plug-In Relays. The front cover is secured with lead seals to detect unauthorized entry. Mounting brackets and hardware are provided to accommodate shelf mounting or plug-in relay rail mounting. The AAR terminal posts are located at the rear of the Solid State Vital Timer. This facilitates wiring to adjacent relay sockets when it is mounted on plug-in relay mounting rails.

Two plug-in printed circuit modules are required to provide one time output and one check output. When an additional time and/or check output is required, a third module is added. Six #4 screws located near the front edge of the timer module are used to set the time interval required. Indicator LEDs on the timer module are invisible thorugh openings in the front cover. The upper LED is lighted when energy is applied to the control terminals. The lower LED lights when the time cycle is completed.

SPECIFICATIONS

Dimensions
Height: 8 inches
(excluding mounting brackets)
Width: 5 inches
Depth: 10.5 inches

Weight
9 pounds (approximate)

Mounting
Shelf or Plug-in Relay Mounting Rails

Input Voltage
9.6 to 15 VDC (12 VDC nominal)

Timing Range
0 to 19 minutes & 50 seconds in
10-second increments

ORDERING INFORMATION

To Order: Specify Description and Part Number.

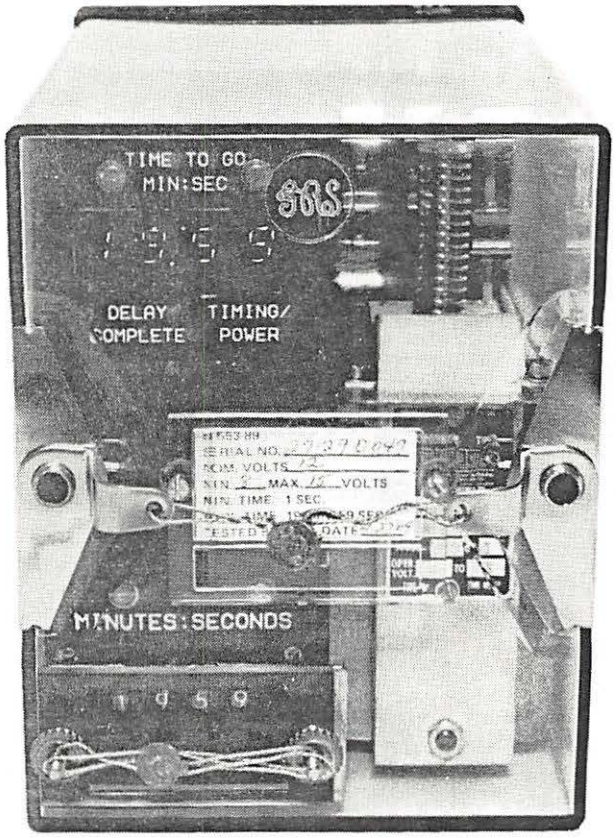
Description		Part Number
Vital Timer		72210-1
Includes:	Timer Module	72214
	Logic Module	72212
Vital Timer		72210-2
Includes:	Timer Module	72214
	Logic Module	72212
	Driver Module	72213

PAMPHLET 1777

Revised DECEMBER 1986

MICROCHRON® TIMER RELAY

OPERATION - INSTALLATION - MAINTENANCE



GENERAL RAILWAY SIGNAL

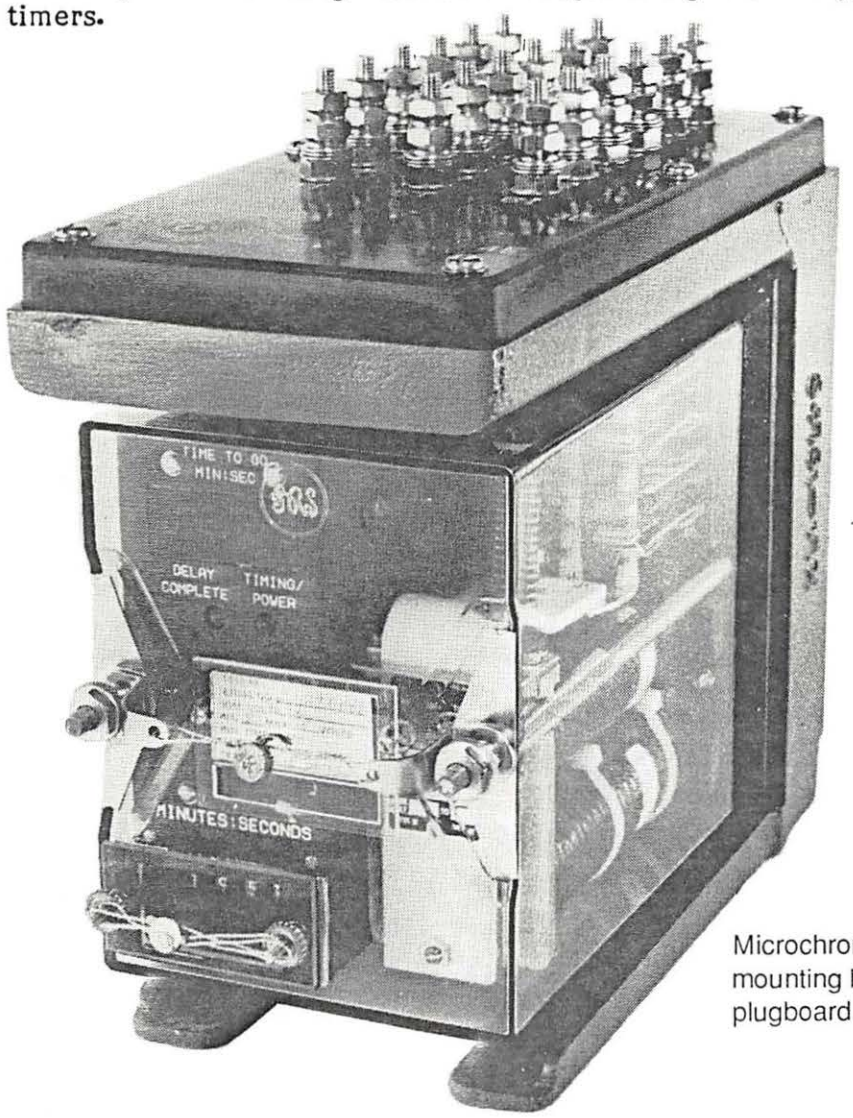
A UNIT OF GENERAL SIGNAL

INTRODUCTION

The GRS Microchron timer is a vital time element relay that contains a standard vital neutral relay structure and a solid-state timer module, comprised of a microprocessor and CMOS technology integrated circuits. Two versions of the Microchron timer are available, with each housed in a standard GRS Type B2 relay enclosure. Normal operating temperature range is from -40°C (-40°F) to +71.1°C (+160°F).

Both versions of the Microchron timer plug onto a B2 plugboard that mounts in a relay rack. Each version with its own B2 plugboard can be mounted into a special shelf or wall mounting bracket having a terminal board with 18 AAR terminal posts. Both versions have a timing range of from one second to 19 minutes and 59 seconds, with accuracy held to ±0.1% of the setting plus a maximum delay of 0.75 second. One version operates on a nominal 12 vd-c; the other operates on a nominal 28 vd-c. Only the 12 vd-c version can operate from unfiltered, full-wave, rectified a-c by adding a filter unit.

With proper installation, both the 12 vd-c and 28 vd-c versions can replace 12 GRS Type B2 electromechanical, motor-operated timers. The 12 vd-c version when mounted in the special mounting bracket can replace eight GRS Type KB motor-operated timers.



Microchron timer with mounting bracket and plugboard.

P1777

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GENERAL DESCRIPTION

The vital relay structure within the Microchron timer has two series-connected coils and contact arrangements of two front-backs (silver-carbon to silver, and silver to silver), three fronts (silver-carbon to silver), and two backs (silver to silver-carbon). A schematic of the coils and contacts is shown in Figure 1.

A solid-state timer module has a vitally programmed microprocessor with delay thumbwheel switch. The module also contains a fuse to protect the electronic components.

The microprocessor, after an adjustable set time-delay interval, electronically energizes the relay coils. Logic controls continuously verify the microprocessor functions. Any interruption of power to the relay, for example, momentary extraneous electrical noise, causes immediate reset to the beginning of the timing interval. The timer module has four printed circuit boards.

The time-select board contains a thumbwheel switch with four settable segments that is used to set the time cycle in one-second intervals from one second to 19 minutes and 59 seconds.

The display board contains a four-digit LED display which shows the time remaining (in minutes and seconds) before the relay is energized; a green LED that illuminates at the end of the timing cycle; and a red LED that indicates when power is applied to the relay. The red LED pulses during the timing cycle and changes to steady red when the cycle ends.

associated integrated circuits, light emitting diode (LED) displays, and a time

The combination vital relay driver and voltage regulator board contains an L-C tuned vital relay driver to energize either a nominal 500-ohm relay structure in a 12-volt Microchron or a nominal 2100-ohm relay structure in a 28-volt Microchron, and a voltage regulator for providing 5-volt power to the integrated circuits. The 12-volt Microchron uses a series 5-volt linear voltage regulator; the 28-volt Microchron uses an integrated circuit switching regulator. Also on the board is an integrated circuit that takes data from the microprocessor and drives the "time to go" display; this circuit board is the only electrical difference between the 12-volt and 28-volt Microchrons.

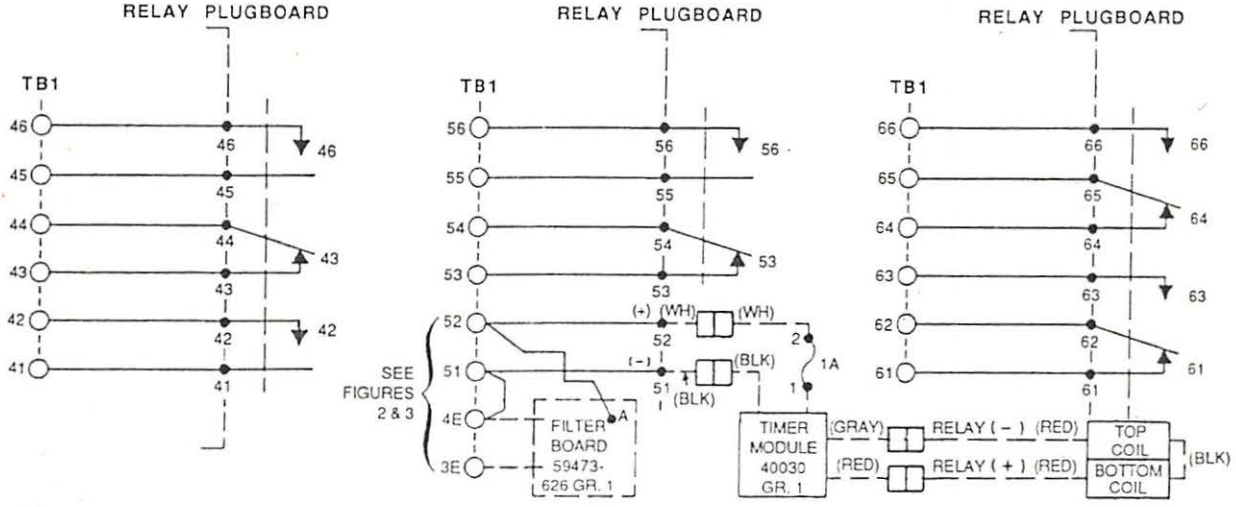


Figure 1. Microchron timer schematic.

The delay processor board contains an 8-bit microprocessor and associated control logic, a 6-bit data latch for storing temporary display and processor control data, a reference clock, and a reset inhibit circuit (Schmitt trigger oscillator) which executes a hardware reset of the processor should a premature halt occur in the program execution. A single microprocessor chip has 1K of EPROM (erasable program memory) and 64 bytes of user data memory, three 8-bit input/output ports, two test inputs and an integral counter/timer. Using CMOS integrated circuits, the reference clock operates at a frequency comparable to that of the microprocessor oscillator. This reference serves as a safety check, ensuring that any deviation in the onboard oscillator, causing improper instruction execution times, will be detectable and result in a restart condition.

INTERCHANGEABILITY

The design of the Microchron timer is different from that of the motor-operated timer so it will always return to the off position when energy is removed. Thus, it provides full "set" time from the instant energy is applied. Because of this characteristic, no back-check contacts are required.

The Microchron timer was designed, however, with back-check contacts to facilitate its use as a replacement for the Types B2 and KB motor timers without wiring changes. Two back-check contacts are in plugboard positions 43-44 and 53-54, as on the Type B2 motor-operated timer. In addition, two front contacts in plugboard positions 45-46 and 55-56, as on the Type B2 motor timer, permit the Microchron timer to be a replacement for Types B2 or KB timer relays if the following warning is obeyed:

WARNING

The Microchron timer may not be interchangeable with a motor-operated timer in every circuit application. Differences in operation of the motor timer back contact require consideration of the check contact operation in the specific application to ensure that the safety performance of the circuit is not compromised. The back-contacts, or check contacts, on the Type B2 and KB motor timers open at the beginning of the timing cycle. The back contacts on the Microchron relay open at the end of the timing cycle.

While it is doubtful that there is a problem with the majority of circuits in use, as an added safety precaution to prevent an inadvertent substitution, the Microchron timer has a registration plate different from any other Type B2 motor timer.

INSTALLATION AND ADJUSTMENT

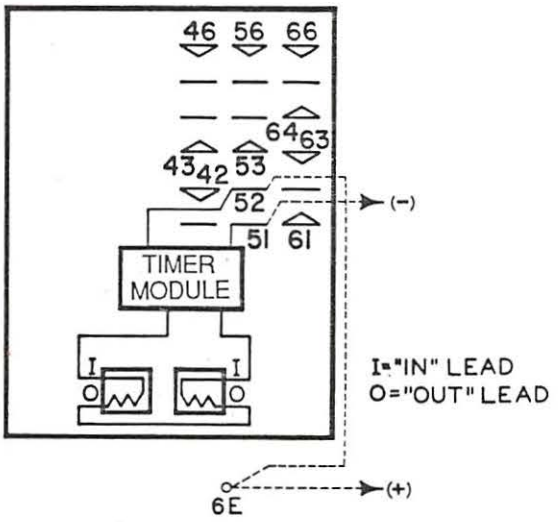
Give consideration to the operating characteristics of the Microchrons before installing any in a particular circuit.

Nominal Input	Input Range	Voltage Rating	Maximum Input Power
12 vd-c	8-15	350 ma. at 15 vd-c	Battery, regulated d-c, or externally filtered rectified a-c
28 vd-c	26.5-31.5	170 ma. at 31.5 vd-c	Battery or regulated d-c

The following instructions describe how to install and adjust (1) the 12 and 28 vd-c Microchron timers at a new field site and as a replacement for existing Type B2 motor-operated timers, and (2) the 12 vd-c version with special mounting bracket as a replacement for the existing Type KB motor-operated timers.

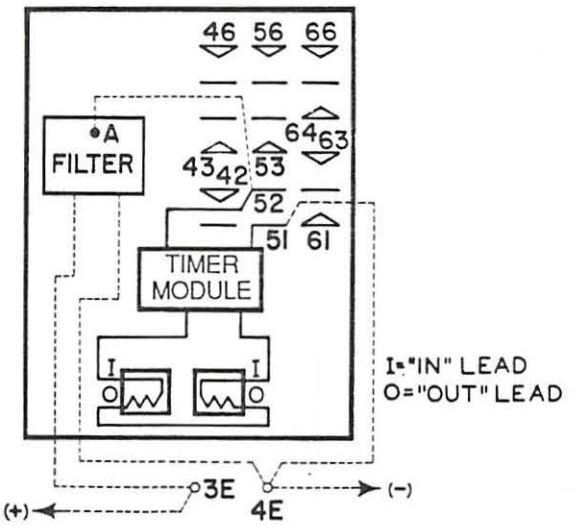
New Installation

1. NOTICE AND HEED the "**CAUTION**" on page 6.
2. For a new installation, install the plugboard in the Type B relay rack, connect the power as shown in Figure 2 or Figure 3, and wire the contacts as required by the external circuits.
3. Attach the mating registration plate (packed with the Microchron timer) to the plugboard and plug in the relay.
4. Set the timing interval as follows:
   a. Remove the seal, thumb nuts, and cover to expose the thumbwheel switches.
   b. Adjust the thumbwheel switches for a desired timing interval.



DOTTED WIRING IS PLUGBOARD WIRING. SOLID WIRING IS WIRING WITHIN THE RELAY.

Figure 2. Wiring of Microchron for d-c operation.



DOTTED WIRING IS PLUGBOARD WIRING. SOLID WIRING IS WIRING WITHIN THE RELAY.

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Figure 3. Wiring of Microchron for operation on unfiltered full-wave rectified a-c.

   c. Energize the relay and check the elapsed time with a stop watch from the instant energy is applied until the relay front contacts close. DO NOT RELY ON THE DISPLAY TO CHECK THE TIME SETTING.
   d. Replace the switch cover, thumb nuts, seal, and crimp the seal.

Replace B2 Motor Timer

1. NOTICE AND HEED the "**WARNING**" on page 4 and the "**CAUTION**" on page 6.
2. Check that the operating voltage applied to the plugboard agrees with the operating voltage range of the Microchron timer.

3. Replace the registration plate on the plugboard with the registration plate supplied with the Microchron timer.
4. Plug in the Microchron timer and set the timing interval as described previously.
5. Verify the time setting.

Replace KB Motor Timer

1. NOTICE AND HEED the "**WARNING**" on page 4 and the "**CAUTION**" on page 6.
2. Check that the supply voltage is within the operating voltage range of the Microchron timer.
3. Disconnect the wires from the AAR terminal posts on the Type KB timer, replace the KB timer with the Microchron relay and mounting bracket, and reconnect the wires to the AAR terminals on the bracket. See Figure 4.
4. Plug in the Microchron timer and set the timing interval as described previously.
5. Verify the time setting.

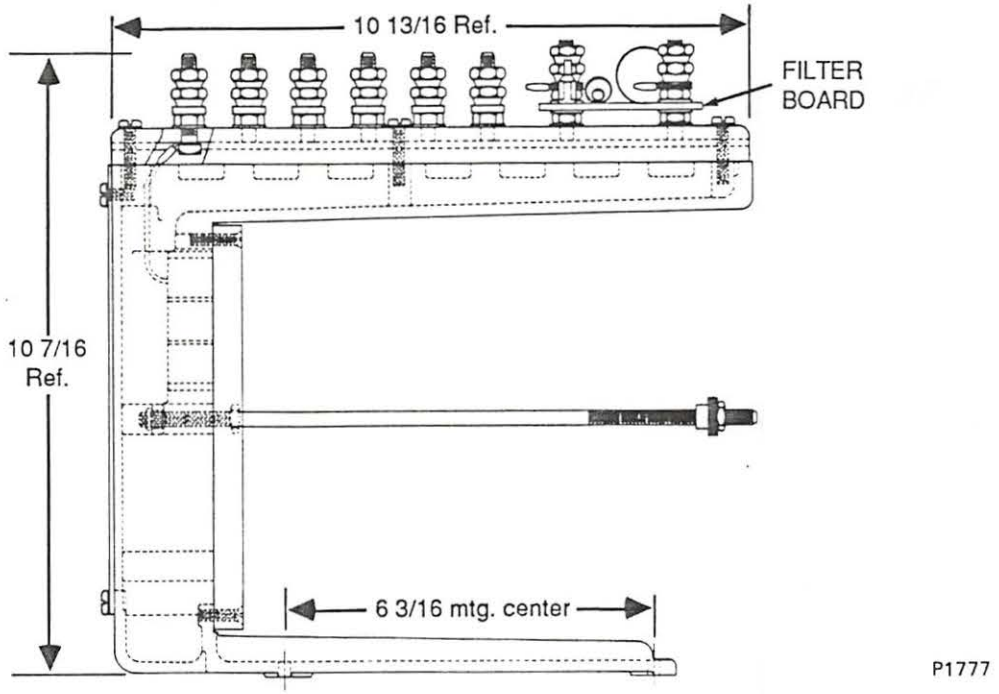


Figure 4. Mounting bracket 30268-18 Gr. 1 with filter board for 12 vdc Microchron timer.

CAUTION

To prevent possible damage to the 12V Microchron timer, use a filter (Figure 5) when operating the relay from unfiltered (12.5-volt average), full-wave, rectified a-c, unless there are standby batteries.

NEVER apply a sustained, unfiltered, rectified a-c voltage whose peak value exceeds 25 volts or average exceeds 15 volts to a 12V Microchron timer. This condition may occur in applications where only rectified a-c is used as the power source or may exist when the Microchron timer is subjected to battery charger output upon removal or disconnection of the battery for test purposes.

Operate the 28V Microchron timer with either battery or regulated d-c input power.

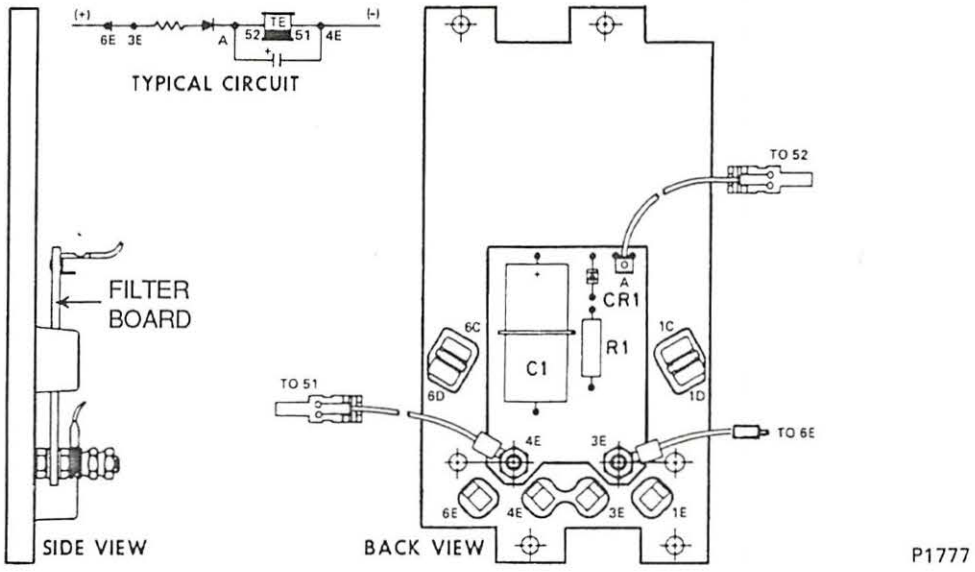


Figure 5. Filter unit 58496-116 Gr. 1 mounted on back of Microchron plugboard.

Surge Protection

Built-in surge circuitry in the Microchron timer provides adequate protection from transients on the power leads for circuits confined to a bungalow or relay room containing an installed Microchron timer. If the energy circuit has contacts remote from the bungalow, install an equalizer across the power leads ahead of where the leads will be wired to the Microchron timer. Figure 6 shows this configuration.

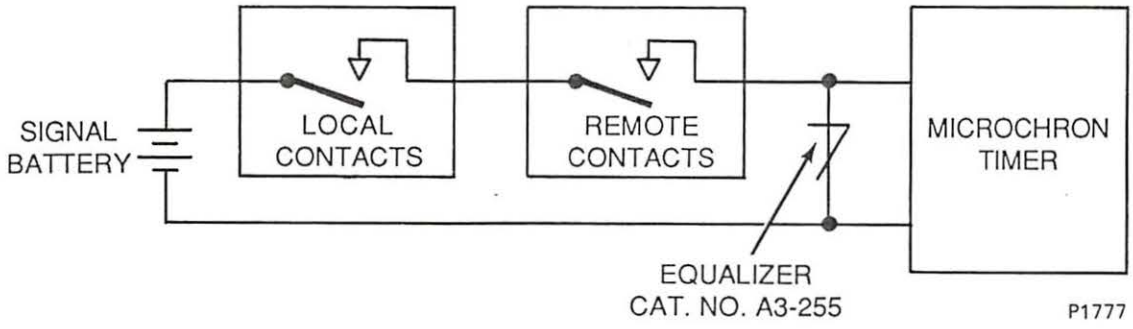


Figure 6. Equalizer wired across power leads of Microchron.

PERIODIC TESTS

Per FRA Section 236.109 timing of Microchron timer should be checked at least once a year. The timing shall be maintained at not less than 90% of the time preselected by the four thumbwheel switches. Do not use the time-to-go display for checking time, use a stop watch or some other external timing device. Also visually inspect the integral relay at this time for damaged or misaligned contacts, corrosion or other contamination, loose parts, broken seals, or a cracked or broken cover.

Adjust and test any relay not passing the above criteria by referring to the "ADJUSTMENT AND TEST INSTRUCTIONS FOR INTEGRAL RELAY STRUCTURE" described later.

MAINTENANCE

For ease of maintenance, diagnostics are included in the Microchron timer program to give maintenance personnel an indication that a failure has occurred in the timer module during program execution. If the external clock circuit fails or incorrect program execution causes the failure of a program timing check, 4444 appears on the time-to-go display; if a failure occurs during the scanning of the time select switch, 5555 appears.

Indication 4444 failures involve the delay processor board; indication 5555 failures involve either the delay processor board or time select board, or a loss of continuity in the flat cable connecting the two boards. Failure of the green LED to illuminate, combined with a lack of relay energization following a correct timing interval, could indicate a failure of the vital driver board. If a board is suspected to be defective, return the entire Microchron timer to GRS for repair.

NOTE: If a Microchron timer fails to operate, check the one-ampere fuse located at the back of the timer module.

ADJUSTMENT AND TEST INSTRUCTIONS FOR INTEGRAL RELAY STRUCTURE

The following instructions enable qualified maintenance personnel to adjust and test the relay portion of the Microchron timer. Additional information is provided in ED sheets ED50800-100 Gr. 1 and ED50800-100 Gr. 2 (pages 14 and 15). Figure 7 gives the proper names of the various relay parts mentioned in the following instructions.

Before making any adjustments or tests on the relay portion of the Microchron timer, the timer module (black box portion of Microchron timer) must be removed from the relay structure as follows:

1. Remove cover and cut two tie wraps holding wires to bottom relay coil. Exercise care during this procedure to avoid damaging coils or wiring.

2. Remove and save three #6-32 screws and #6 shakeproof washers that secure timer module to relay base.

3. Remove and save square nut that is on left relay guide tube and against front of timer module.

4. Carefully remove timer module to gain access to four single circuit cap connectors.

5. Disconnect four connectors and set timer module aside.

General Information

Before making adjustments to the relay, visually check for the following conditions:

1. Contact groups and mounting screws are tight.

2. Pusher retaining clips are properly assembled and do not bind on pusher, thus allowing free movement of pusher.

3. Pusher is not bent, broken or cracked due to being forced on the bridge (arm extension).

4. Each pusher does not rub against the contact springs or stops in any position.

5. Armature does not bind and rides properly on the armature bearing plate. Clearance between the front face of the armature and the edge of the armature retaining plate is .002-inch minimum to .004-inch maximum, for any position of the armature.

6. Compression spring does not rub on stud in any position of the armature.

7. Compression spring fits properly against shoulder on lock nut.

8. Lock nut is properly in place on coil spring stud.

Armature Air Gap

The armature air gap is defined as the closest point between the armature and the core face when the armature is in the full energized position. Fixed pins in the core act as safety pins and they must not touch the armature in any position. An adjustable residual screw is used to obtain the specified air gap and must be locked tight in place by the lock nut provided.

The armature working air gap must not be less than a free .010 inch. This means a .010-inch feeler gauge must pass freely between the armature and cores at any point, except at the fixed safety pins.

Bridge Travel

Bridge travel is the air gap between the bracket and the armature stop screw when the relay is energized. This air gap should be .087-inch minimum. The armature stop screw is adjusted to provide the air gap and the screw is secured in place by the lock nut. Generally, operating values of the relay are easier to obtain when this air gap is held to the minimum value.

Contact Group Adjustments

Contact pressure is created by contact follow resisted by the pressure plate. Armature springs (heel contact spring) are adjusted with a down pressure before assembling the pusher. The adjustment of the contact group consists of positioning the pressure plate and stop plate on each stationary spring to ensure the correct amount of contact follow. Contact follow is the total movement of the heel contact caused by the armature bridge raising the pusher.

When making contact pressure measurements, place the gram gauge at the center of the extreme outer end of the spring as close to the contact as possible to obtain a true reading. Back contact springs must move a minimum of .010 inch from the stop plate; this measurement is taken at the end of the stop plate. Armature springs on all groups are adjusted with a down pressure. The back contacts pressure is a minimum of 21 grams for silver-to-silver contacts while back contact pressure is a minimum of 25 grams for silver-carbon to silver contacts. Front contact pressure is a minimum of 45 grams.

With the relay deenergized, the down pressure on each pusher with the back contacts making contact must be between 5 and 30 grams. Under this condition, the roller on each armature spring rests on the bottom of the pusher slot.

The adjustment of the front and back contact springs is a straight forward procedure which requires several passes with the adjustment tools before the

correct values are obtained. This is because it is nearly impossible to make the ideal adjustment the first time through the procedure.

Begin by bending the pressure plate so as to force the contact spring to the proper position as determined by the make and break values. Proper adjustment of a back contact occurs when the make and break values are .065 and .060 inch, respectively. Similarly, the front contact adjustment is proper when the make and break values are .033 and .040 inch, respectively.

Make and break adjustments for front and back contacts are measured by inserting the proper thickness gauge between the adjustable residual screw and core face. With the break gauge in place, all specified contacts are open. With the make gauge in place, all specified contacts are closed.

The contact spring bears against the pressure plate. The stop plate does not interfere with the positioning of the contacts at the proper make and break values.

With the contact spring properly positioned, the stop plate is bent toward the contact spring until it just touches the spring. A check of the adjustment is next to ensure that the front and back contacts (as applicable) make and break according to the aforementioned values. Note that the spring bears against the pressure plate and touches the stop plate.

Should a pressure plate or stop plate be bent too far away from a contact spring, this can be corrected by bending the plate to stop a little too near the spring and then bend the plate away from the spring.

Mechanical Tests

These tests are made to ensure that the relay structure is properly adjusted. In doing these tests, mount the relay onto a plugboard support about 18 inches above a bench on a plugboard holding stand. Secure the relay to the plugboard with two retaining nuts to hold the relay in place. Proceed as follows to complete the mechanical tests:

1. Check the following areas to be sure that all adjustments are proper: armature air gap, bridge travel, back and front contact make and break, contact openings and pressures.

Armature air gap (minimum)	.010"
Bridge travel (minimum)	.087"
Contacts:	
Back make	.065"
Back break	.060"
Front make	.033"
Front break	.040"
Contact pressure:	
Back S-S (minimum)	21 grams
Front AgC-S (minimum)	45 grams
Back S-AgC (minimum)	25 grams

2. Using a pressure gauge at the adjustable residual screw, verify that it requires two ounces minimum pressure to just raise the armature stop screw from its stop.

3. Check that all armature springs on the contact block are adjusted with a down pressure. It is important to keep the down pressure about the same on all back contacts. Each roller on the contact spring bears on the bottom of its slot in the pusher when the pusher is raised sufficiently to just open the back contacts.

4. Insert about a .010-inch feeler gauge behind the armature residual screw to hold the back contacts open and using a small bar under the bottom of the pusher, gently push up on the bar to see that the pusher rises slightly without moving the armature. While holding the armature in this position, notice the roller on each heel spring rests on the bottom of the jaw in the pusher. This enables the springs to be adjusted to always open the front contacts in case of a failure at the bottom end of the pusher.

5. Use a strip of clean, white hard bond paper to clean between the core and adjustable residual screw. Draw the paper through this place several times or until no discoloration appears on the paper strip while applying pressure to the armature.

6. Place the cover on the relay. Tighten the cover in place with the sealing nuts but do not to the point that the cover warps or buckles. The nuts must not project beyond the end of the support tubes. Bend the sealing end of the nuts so there is no pressure between the two.

7. Check the contact prongs on the back of the relay with the proper gauges: 56260-8 Gr. 1 and 56260-10 Gr. 1.

Electrical Tests

Electrical tests are made to verify the operating current values and to check contact resistances of the relay. If the relay does not operate at the proper values, readjust the relay to the readjustment values specified on the ED sheets -- ED50800-100 Gr. 1 or ED 50800-100 Gr. 2. To power the relay, apply a variable current source to the two red leads (one coming from each relay coil). This is done by using a meter tip plug to interface the current source with the female cap connectors on the red leads.

1. Apply saturation current as listed on the ED sheet for the relay under test.

2. Slowly decrease current to relay to find the drop away value. This is visually determined by seeing the back contacts just make. Record this current value.

3. Remove relay power. Reapply relay power and increase the output from the current source until the relay just makes its front contacts and read the pickup value. Record this current value.

   NOTE: At this current value, the armature should continue to move until it hits the front stop screw. This current value is the working current.

4. Compare the measured values of the two currents with the ED sheet readjustment value. If these values are within the limits of the ED sheet, the relay is properly adjusted. If not, recheck the adjustments against the foregoing instructions and retest the relay as per steps 1-3 above.

After the relay is checked and/or readjusted, reassemble the timer module to the relay as follows:

a. Connect four single circuit connectors per page 3, Figure 1. Pay particular attention to color coding of the wiring. Connectors are not keyed so it is possible to plug a connector into an incorrect location which can cause damage to the timer module.

b. Gather wiring together and keep it clear as the timer module is reinstalled on the relay base. Use three #6 screws and washers removed earlier.

c. Reassemble square nut on left relay tube only finger tight against timer module. Nut should be positioned such that the cover can be assembled without interference.

d. Using two tie wraps (GRS Part Number 01232-1) one on either side of the four connectors, tie the four wires to the lower relay coil. Position connectors side by side so that after tie wraps are tightened the connectors can be pushed into place between timer module and bottom relay coil.

e. Visually inspect relay to insure no wiring is pinched between timer module and relay base and that all wiring is secured to the bottom coil and not loose to possibly interfere with safe relay operation.

f. Before installing the relay cover, check for correct operation of the Microchron timer.

NOTE: If the Microchron timer completes its time cycle and the green LED comes on but the relay does not pick, check the relay coil connections.

Contact Resistance

The resistance value of a clean contact is quite low. A contact may be cleaned by using a clean strip of white bond paper or a sand-blasted feeler gauge, GRS part number 55411-3. Values of contact resistances vary according to the materials used: Measurement to be made at relay prongs with one ampere through the contact.

Front, silver-carbon to silver (AgC-S) .09 ohm maximum.

Back, silver to silver (S-S) .03 ohm maximum.

Back, silver to silver-carbon (S-AgC) .18 ohm maximum.

ORDERING AND OTHER INFORMATION

Refer to GRS Assemblies Catalog 62-1 when ordering a Microchron timer and give both the catalog number and quantity wanted.

Additional information on the relay, such as pertaining to the contacts and coils, how to make wiring changes, how to figure the line voltage, et cetera, is found in GRS Pamphlet 1457.

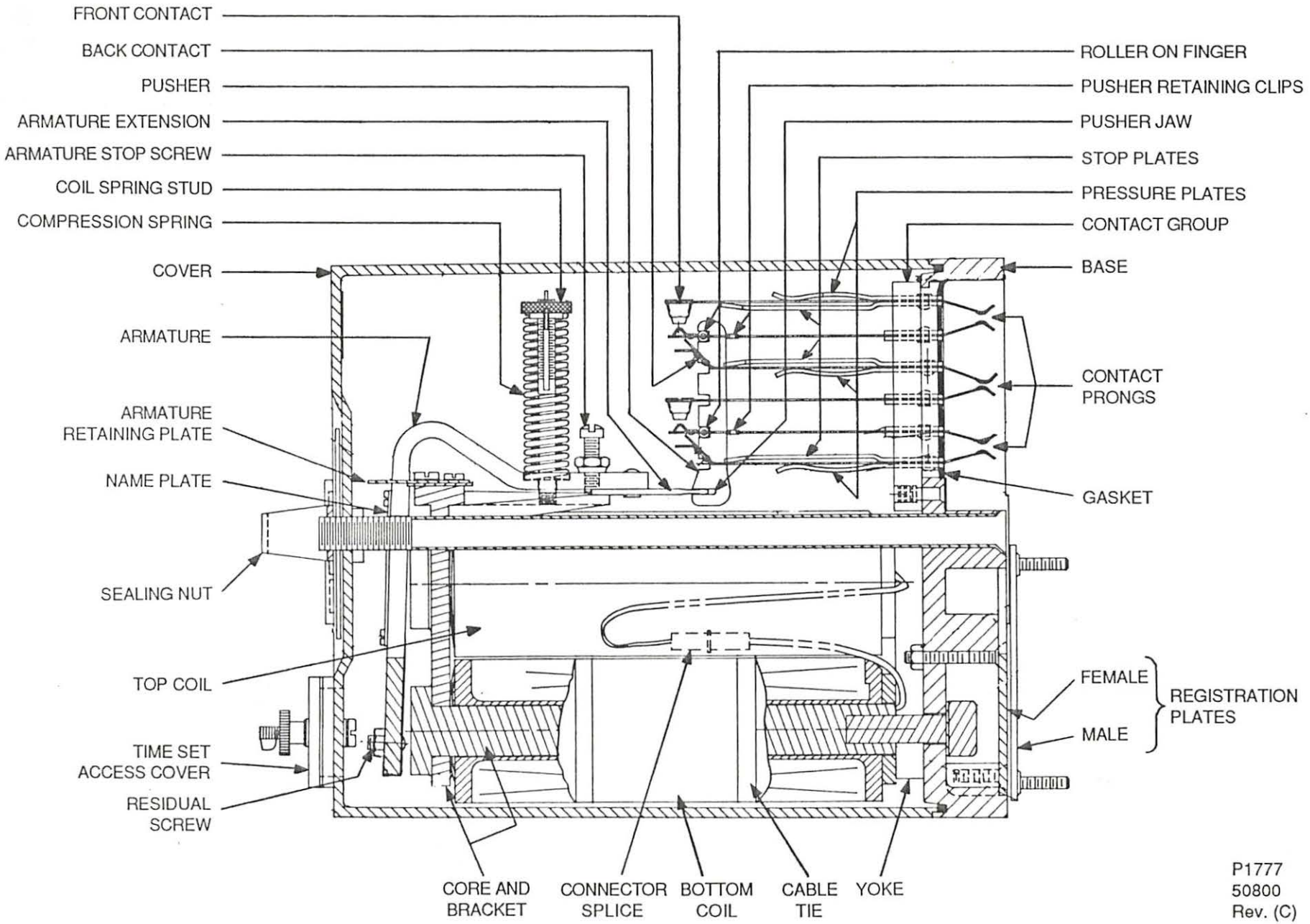


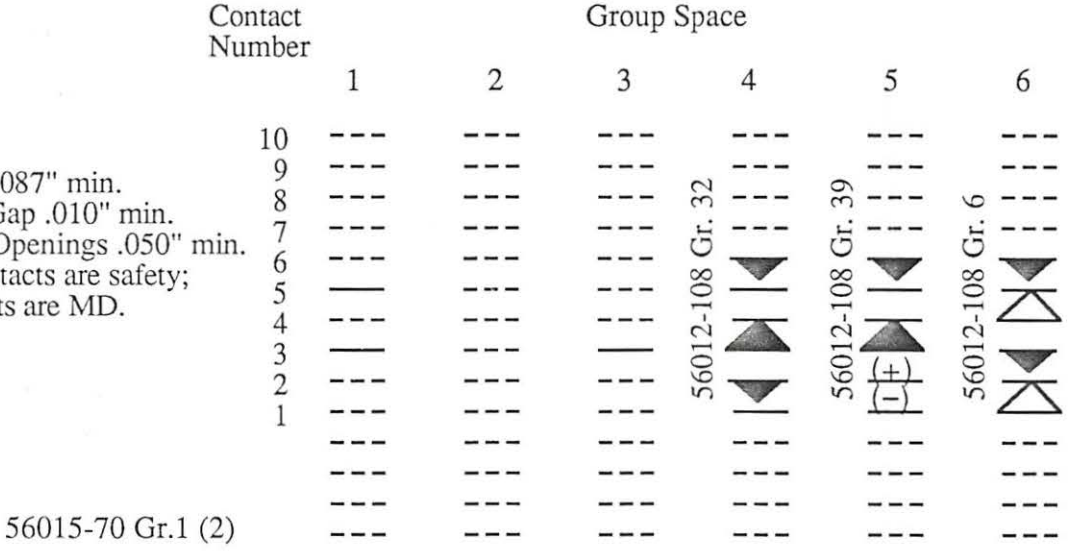
Figure 7. Side view of relay shown in deenergized position.

APPLICATION INFORMATION FOR
RELAY 50800-100 Gr. 1 TYPE Microchron Timer
CATALOG NUMBER A62 - 627
CONTACTS 2FB (Ag C-S, S-S); 3F(Ag C-S); 2B(S-Ag C)
PLUGBOARD MOUNTING 59686-7 Gr. 12

ED 50800-100 GR.1

DC Operating Volts 8 Min., 15 Max.
Nominal Relay resistance 500 ohms
Temperature Range -40°F to 160°F
Max. Current Draw of Timer .350A During Timing Cycle, .240A After Timing Cycle.

Bridge Travel .087" min.
Armature Air Gap .010" min.
Front Contact Openings .050" min.
Solid (▼) contacts are safety;
all other contacts are MD.



Coil Dwg. No: 56015-70 Gr.1 (2)

Contact Data: -

Application	(S) Safety	(MD) Med. Duty
Application Volts	Up to 30	Up to 30
*Max. Rating - Amps.	4	4
Max. Rating - Volts	30	30

*Based on Resistive Loads - Derate as a percentage of resistive load the following loads: Inductive 60%, Motor 40%.

NOTE 1: RELAY PORTION OF TIMER ONLY-DOES NOT INCLUDE CURRENT REQUIREMENT OF ELECTRONICS. DO NOT MEASURE VALUES IN FIELD.

Application Limits (NOTE 1)
Drop Away (Min.) .0038 A
Pick Up (Max.) .0126 A
When operate values exceed these limits, recondition the relay to provide satisfactory performance.

Readjustment Values
(NOTE 1)
Readjust relay to operate at values shown below. See mechanical adjustment data on pages 8-11 and above.

Sat.	Drop Away (Min.)	Pick Up (Max.)	Working (Max.)
.046A	.0054 A	.0121 A	.0121 A

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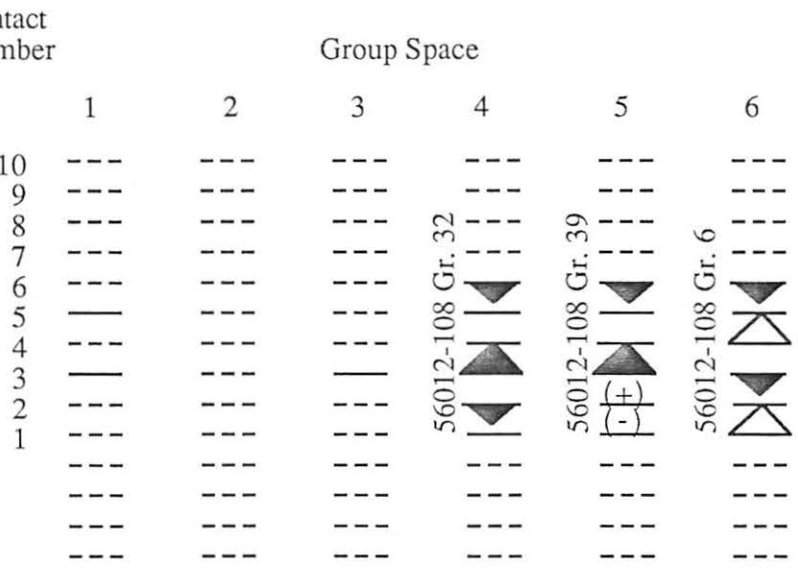
APPLICATION INFORMATION FOR
RELAY 50800-100 Gr. 2 TYPE Microchron Timer
CATALOG NUMBER A62 - 628
CONTACTS 2FB (Ag C-S, S-S); 3F(Ag C-S); 2B(S-Ag C)
PLUGBOARD MOUNTING 59686-7 Gr. 12

ED 50800-100 GR.2

DC Operating Volts 26.5 Min., 31.5 Max.
Nominal Relay resistance 2100 ohms
Temperature Range -40°F to 160°F
Max. Current Draw of Timer .170A During Timing Cycle, .140A After Timing Cycle.

Bridge Travel .087" min.
Armature Air Gap .010" min.
Front Contact Openings .050" min.
Solid (▼) contacts are safety; all other contacts are MD.



Coil Dwg. No: 56015-70 Gr.2 (2)

Contact Data: -

Application	(S) Safety	(MD) Med. Duty
Application Volts	Up to 30	Up to 30
*Max. Rating - Amps.	4	4
Max. Rating - Volts	30	30

*Based on Resistive Loads - Derate as a percentage of resistive load the following loads: Inductive 60%, Motor 40%.

NOTE 1: RELAY PORTION OF TIMER ONLY-DOES NOT INCLUDE CURRENT REQUIREMENT OF ELECTRONICS. DO NOT MEASURE VALUES IN FIELD.

Application Limits (NOTE 1)
Drop Away (Min.) .0020 A
Pick Up (Max.) .0060 A
When operate values exceed these limits, recondition the relay to provide satisfactory performance.

Readjustment Values
(NOTE 1)

Readjust relay to operate at values shown below. See mechanical adjustment data on pages 8-11 and above.

Sat.	Drop Away (Min.)	Pick Up (Max.)	Working (Max.)
.020A	.0027 A	.0058 A	.0058 A

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PRUDENTIAL PLAZA SUITE 2120 CHICAGO IL 60601 Phone: 312 • 467-1221

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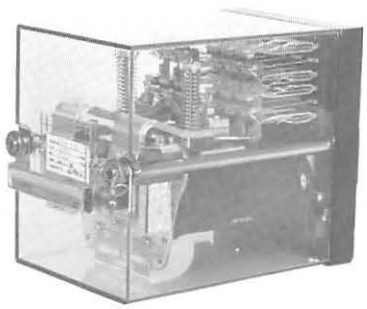
GEC-GENERAL SIGNAL LIMITED
ELSTREE WAY BOREHAMWOOD HERTFORDSHIRE WD6 1RX ENGLAND Phone: 44-1-953-2030
Cable: RAILSIGKO BOREHAMWOOD (ENGLAND) Telex: 851-22777 GECBWD G BOREHAMWOOD (ENGLAND)

ALGEMENE SEIN INDUSTRIE B.V.
CROESELAAN 28 3521 CB UTRECHT NETHERLANDS Phone: 31-30-94-26-46
Cable: GENRASIG UTRECHT (NETHERLANDS) Telex: 844-47455 GRASI NL UTRECHT (NETHERLANDS)

REPRESENTATIVES AND LICENSEES THROUGHOUT THE WORLD

TYPE ST1 AND ST2 VITAL PLUG-IN RELAYS



- SIZE 1 AND SIZE 2
- READILY MOUNTS TO EXISTING SOCKETS
- ALL FERROUS METAL PARTS ARE NICKEL PLATED
- MEETS OR EXCEEDS APPLICABLE AAR RECOMMENDED PRACTICES

Safetran Type ST1 and ST2 Vital Circuit Signal Relays are compact plug-in circuit switching elements housed within a clear plastic case for use in modern railway systems. These relays incorporate the required control characteristics as well as operating security for this application.

Type ST1 and ST2 relays fit into size 1 and 2 sockets already in common use. These relays are interchangeable with existing types of relays as well. Each relay carries a registration plate unique to that specific type. Sockets have like indexing pins to ensure insertion of the proper relay for each circuit function.

All contact and coil connections are brought out through the base of the relay as spring prongs. The socket has wedge shaped plug insulators with flat metal terminals on both the upper and lower surfaces. Relays are guided into the socket by two rods so that each pair of prongs engage their respective socket terminals, making a firm, low resistance contact. The socket terminals are available in either the solder or crimp types. Terminals are easily removed from the back of the socket for making wiring changes without unplugging the relay.

Contact support springs are phosphor bronze, molded in phenolic blocks. Relays are provided with space for three such blocks. Normally open or front contacts are fine silver to silver impregnated carbon; normally closed or back contacts are fine silver to fine silver. Regular, heavy duty, extra heavy duty; tungsten, and magnetic arc suppressed contacts are available. All ferrous metal parts of these relays are nickel plated. These relays have a highly efficient magnetic structure, making routine calibration quick and easy. A heavy armature provides for positive drop away. These relays meet or exceed all applicable AAR recommended practices.

TYPE ST PLUG-IN RELAYS ORDERING INFORMATION

NEUTRAL RELAY, REGULAR-RELEASE TYPE ST DIRECT CURRENT, LINE AND TRACK

TYPES ST1 AND ST2, DIRECT-CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Notes	Part Number
6FB	1.8	0.13	Track	400013
4FB-2F-1B	1.8	0.13	Track	400012
6FB	4	0.089	Track	400010
4FB-2F-1B	4	0.089	Track	400011
4FB-2F-1B	50	0.037	Line	400014
6FB	60	0.033	Line	400028
6FB	84	0.0195	Line	400001
4FB-2F-1B	100	0.0192	Line	400015
2FB	200	0.019	EHD Lamp Control	400021
4FB-2F-1B	350	0.0136	HD Contacts	400027
6FB	500	0.0121	Line	400000
4FB-2F-1B	500	0.0121	Line	400004
4FB-2F-1B	500	0.0121	HD Contacts	400020
4FB	500	0.0136	HD Contacts	400025
6FB	500	0.0165	EHD Contacts	400023
12FB	500	0.0152	Line	450000(ST2)
4FB-2F-1B	900	0.0084	Line	400003
4FB-2F-1B	900	0.0092	HD Contacts	400022
6FB	900	0.0084	Line	400017
4FB-2F-1B	1800	0.0047	Line	400002

NEUTRAL RELAY, SLOW-PICKUP TYPE ST1 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Pickup	Part Number
4FB-2F-1B	300	0.034	1.4 Sec	400101
6FB	220	0.041	1.35 Sec	400100

NEUTRAL RELAY, SLOW-RELEASE TYPE ST1 AND ST2 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Release	Part Number
2FB	24	0.023	.4 Sec	400221
2FB-4B	80	0.024	.1 Sec	400220
4FB-2F-1B	194	0.035	1 Sec	400211
6FB	194	0.035	1 Sec	400210
4FB	194	0.033	3 Sec @ 12V	400200
4FB-2F-1B	194	0.0335	2.8 Sec @ 10V	400212
12FB	260	0.0231	.825 - 1.1 Sec @ 10V	450200(ST2)
2FB	460	0.014	3.0 Sec @ 9V	400213

NEUTRAL RELAY, SLOW-PICKUP AND SLOW-RELEASE TYPE ST1 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Release	Part Number
4FB-2F-1B	194	0.046	1.1 Sec	400400

BIASED RELAY, SLOW-RELEASE TYPE ST1 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Release	Part Number
6FB	194	0.026	1 Sec	400530

BIASED RELAY, SLOW-PICKUP TYPE ST1 AND ST2 DIRECT CURRENT, LINE

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Minimum Time of Release	Part Number
6FB	800	0.0119	1.25 Sec	400540
8FB-4F-2B	800	0.0135	1.25 to 1.5 Sec	450300(ST2)

LIGHT-OUT NEUTRAL RELAY TYPE ST1, AC OR DC

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	For Use With Lamps		Maximum Working Amps AC or DC	Part Number
		Volts	Watts		
4FB	.24 w/400300 Rectifier	10	5+3.5	0.68	400303-X
4FB	.24	10	5+3.5	0.68	400303
4FB	450/.069 w/400300 Rectifier	10	18+3.5	.0115/1.68	400302-X
4FB	450/.069	10	18+3.5	.0115/1.68	400302
4FB	450/.12 2/400300 Rectifier	12-16	21 (C.P.)	.115/.833	400300-X
4FB	450/.12	12-16	21 (C.P.)	.115/.833	400300
6FB	450/.2 w/400300 Rectifier	10	10	.016/.840	400301-X
6FB	450/.2	10	10	.016/.840	400301

NOTE: Part No. with -X means with Rectifier Assembly. For Rectifier Assemblies see page I-1-9.

SWITCH-CONTROL RELAY TYPE ST1 DIRECT CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Switch Machine Operating Voltage	Maximum Pickup & Working Amperes	Notes	Part Number
2F-2B	500	Low or High (20) (110)	0.019	Biased Neutral EHD Contacts	400520
4FB	500	Low	0.0136	Neutral EHD Contacts	400025

SWITCH-OVERLOAD NEUTRAL RELAY TYPE ST1 DIRECT CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Switch Machine Operating Voltage	Overload Rating Amperes	Part Number
2B	.068/1225	High	12	400600
2CBO*	.064/135	Low	18	400601
2CBO*	.068/220	High	11.5	400602
2CBO*	.125/135	High	7.5	400604
2CBO*	.064/135	High	12	400605

*Close Before Open

BIASED-NEUTRAL RELAY TYPE ST1 AND ST2 DIRECT CURRENT

To Order: Specify Contacts, Resistance, and Part Number.
Note: This relay is magnetically biased to pickup on one polarity only.

Contacts	Nominal Resistance Ohms	Maximum Pickup and Working Amperes	Notes	Part Number
4FB	0.5	0.356	Track	400511**+
5F-4B	0.5	0.365	Track	400515**+
5F-4B	0.5	0.374	Track	400508**+
4FB-2F-1B	2	0.158	Track	400510**+
6FB	2	0.13	Track	400512**+
4FB	2	0.185	Track	400518
5F-4B	4	0.126	Track	400507
6FB	63	0.0305	Series Line	400501
4FB-2F-1B	100	0.626	Line	400504
8FB-4F-2B	350	0.0189	Line	450501 (ST2)
12FB	350	0.0189	Line	450500 (ST2)
6FB	500	0.0121	HD Contacts	400505
6FB	500	0.0121	Line	400500
4FB-2F-1B	500	0.0121	Line	400502
4FB-2F-1B	500	0.0121	HD Contacts	400506
6FB	800	0.0088	Line	400516
8FB-4F-2B	800	0.011	Line	450502 (ST2)
2FB-4F-2B	1000	0.0088	Line	400503
4FB	2000	0.006	Track	400517+

Notes: ** Two 1.0 Ohm Coils Connected in Multiple for 0.5 0hm and Series for 2.0 Ohms
+ High DA/PU Ratio Track Relay

FLASHER RELAY FOR HIGHWAY CROSSING WARNING AND FLASHING SIGNAL ASPECTS TYPE ST1 DIRECT CURRENT WITH SOLID STATE FLASHER UNIT

To Order: Specify Description and Part Number.

Contacts	Nominal System Voltage	Relay Coil Nominal Resistance Ohms	Flashing Rate	Part Number
4FB	8-16	60		400700
4FB	8-16	60 w/400700-1X Flasher Module	40-45 FPM	400700-X
4FB	8-16	60 w/400700-8X Flasher Module	56-64 FPM	400700-7X

POWER-TRANSFER NEUTRAL RELAY TYPE ST1

To Order: Specify Contacts, Voltage, and Part Number.

Contacts	Rated Voltage AC	Nominal Resistance Each Side - Ohms	Part Number
6FB	10	100/100 (Metal to Metal Contacts)	400800
6FB	10	100/100 w/400800-1X Rectifier Assy	400800-X
6FB	10	100/100 (Metal to Carbon Contacts)	400801
6FB	10	100/100 w/400800-1X Rectifier Assy	400801-X
6FB	12	100/100 (Metal to Metal Contacts)	400802
6FB	12	100/100 w/400800-1X Rectifier Assy	400802-X

POLARIZED RELAY TYPE ST1 & ST2, DIRECT-CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Size	Contacts	Normal & Reverse Operating Ampere	Nominal Resistance Ohms	Maximum Polar Pickup and Working Amperes	Part Number
2	6NR	-------	500	0.0065	450900 (ST2)
2	4FB-4NR	-------	500	0.0049	450901 (ST2)
2	4NR-2FB-2F (HD)	-------	125/.14	0.0116	450902 (ST2)
1	2NR	.010 to .012	520	-------	400903 (ST1)

MAGNETIC-STICK RELAY TYPE ST1, DIRECT-CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Contacts	Nominal Resistance Ohms	Maximum Normal Reverse Working Amperes (Double Coil Operation)	Part Number
4NR, Carbon to Metal	500	0.011	400900
2NR, Silver Platinum	26 x 26	0.021	400901

CODE RESPONSIVE RELAY TYPE ST1, DIRECT-CURRENT

To Order: Specify Contacts, Resistance, and Part Number.

Nominal System Voltage	Contacts	Nominal Resistance Ohms	Notes	Part Number
12	2FB Front - Silver & Platinum Back - Tungsten	200	Line Code Repeater	400950
10	4FB Tungsten	80	Line Code Repeater	400951
10	2NR Silver & Platinum	22-22	Polar-Stick Relay	400952
12	2FB Front - Silver/Platinum Back - Tungsten	80	Line Code Repeater	400953
10	4FB Silver & Platinum	80	Line Code Repeater	400954

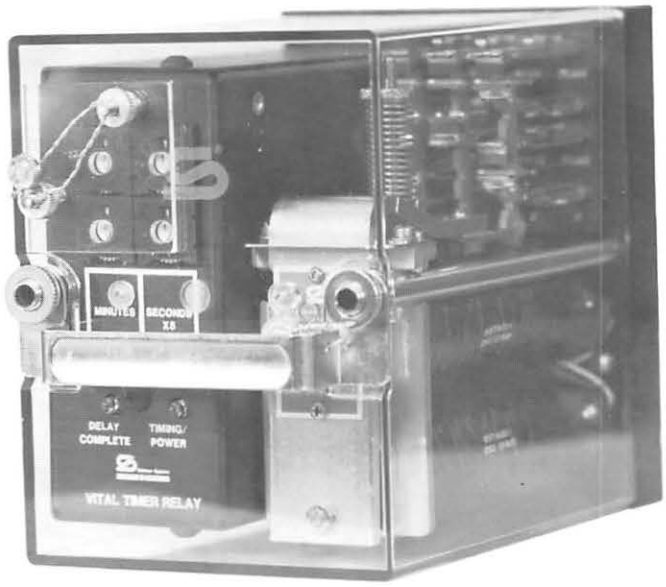
Note: Silver-Platinum contacts for 30 volts or less
Tungsten contacts for over 30 volts

VANE RELAY - A/C, TYPE ST2, TWO POSITION, TRACK RELAY

To Order: Specify Contacts, Resistance, and Part Number.

Contracts	Local Winding Volts	Track Winding Volts	Frequency (Hz)	Part Number
4F-4B	110/55	1.0/0.5	60	450992
4F-4B	110/55	2.0/1.0	100	450993
2F-2B	55	5.0	60	450994

VITAL TIMER RELAY



The Safetran ST 451000-X Vital Timer Relay is designed to provide a precise, preset pickup delay for time locking, electric switch lock releases and other vital timing applications for a nominal 12 volt system. It consists of a vital solid state electronic timer module mounted together with a Type ST neutral relay in a double-wide ST relay housing.

The electronic timer is adjustable in increments of five seconds, from 5 seconds minimum to 15 minutes, 55 seconds maximum. Timing starts upon application of power. At the end of the timing period, the relay will energize. The unit will respond only with input polarity as indicated.

The unit replaces most electromechanical vital timer relays and is plug compatible with a GRS A62-6276 timer relay.

The timer module consists of a digital electronic timer on two printed circuit boards in an aluminum housing. Timing is controlled by a high accuracy quartz crystal oscillator with an adjustable countdown divider to an accuracy of less than one second over the entire timing range. Switches protected by a removable front cover set the timing interval in increments of five seconds as indicated above. LED lamps are provided to indicate timing in progress and timing complete.

Timing commences when power is applied to the input terminals of the relay. If power remains on, the electronic module will energize the relay after the preset interval. If power is interrupted before completion of the timing cycle, the timer is instantaneously reset. The full timing interval will commence when the input terminals are reenergized.

Time is set by means of four screwdriver adjusted switches on the front of the relay located under a sealed clear cover. These are accessed by removing two #8 thrumbscrews and removing the cover.

SPECIFICATIONS

Nominal System Voltage	Input Current	Contacts	Time Range		Part Number
			Min	Max	
9.5-16	0.2 Amp	2FB-3F-2B	5 Sec	15 Min, 55 Sec	451000-X

TYPE ST PLUG-IN RELAYS ORDERING INFORMATION FOR COMPLETE ASSEMBLIES

To Order: Specify Description and Relay Number with Assembly Number.

Description	Relay Number	Assy Number
For all Relay Numbers except 400300-X, 400301-X, 400302-X, 400303-X, 400700-X, 400700-7X, 400800-X, 400801-X and 400802-X (These Numbers do not include rectifier or flasher units)		
w/Socket Only (Less Tabs)		-10X
w/Socket Only (Less Tabs) and Voltage Test Post Kit		-11X
w/Socket and 20-16 Crimp Type Tabs		-12X
w/Socket, Voltage Test Post Kit and 20-16 Crimp Type Tabs		-13X
w/Socket and Solder Type Tabs		-14X
w/Socket, Voltage Test Post Kit and Solder Type Tabs		-15X
w/Socket and 14-10 Crimp Type Tabs		-16X
w/Socket, Voltage Test Post Kit and 14-10 Crimp Type Tabs		-17X
For Relay Numbers 400300-X, 400301-X, 400302-X and 400303-X (These numbers include rectifier units)		
w/Socket Only (Less Tabs)		-100X
w/Socket Only (Less Tabs) and Voltage Test Post Kit		-110X
w/Socket and 20-16 Crimp Type Tabs		-120X
w/Socket, Voltage Test Post Kit and 20-16 Crimp Type Tabs		-130X
w/Socket and Solder Type Tabs		-140X
w/Socket, Voltage Test Post Kit and Solder Type Tabs		-150X
w/Socket and 14-10 Crimp Type Tabs		-160X
w/Socket, Voltage Test Post Kit and 14-10 Crimp Type Tabs		-170X
For Relay Numbers 400700-X 40-45 FPM & 400700-7X 50-65 FPM (These numbers include Flasher Unit)		
w/Socket Only (Less Tabs) 400700-X (40-45 FPM)		-100X
w/ Socket and 20-16 Crimp Tabs 400700-X (40-45 FPM)		-120X
w/Socket and Solder Type Tabs 400700-X (40-45 FPM)		-140X
w/Socket and 14-10 Crimp Tabs 400700-X (40-45 FPM)		-160X
w/Socket Only (Less Tabs) 400700-7X (50-56 FPM)		-107X
w/Socket and 20-16 Crimp Tabs 400700-7X (50-56 FPM)		-127X
w/Socket and Solder Type Tabs 400700-7X (50-56 FPM)		-147X
w/Socket and 14-10 Crimp Tabs 400700-7X (50-56 FPM)		-167X
For Relay Numbers 400800-X, 400801-X and 400802-X (These numbers include rectifier)		
w/Socket Only (Less Tabs)		-100X
w/Socket and 20-16 Crimp Type Tabs		-120X
w/Socket and Solder Type Tabs		-140X
w/Socket and 14-10 Crimp Type Tabs		-160X

Note: Current Test Post Kit is included with all relay sockets.

RELAY MODULES AND RECTIFIERS ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Transistor Rect Module for 400300 Relay, w/mounting hardware	400300-1X
Transistor Rect Module for 400301 Relay, w/mounting hardware	400300-1X
Transistor Rect Module for 400302 Relay, w/mounting hardware	400300-1X
Transistor Rect Module for 400303 Relay, w/mounting hardware	400300-1X
S-Pack Flasher Module for 400700 Relay, w/mounting hardware, 40-45 FPM	400700-1X
S-Pack Flasher Module for 400700 Relay, w/mounting hardware, 50-65 FPM	400700-8X
S-Pack Flasher Module for 400700 Relay, w/o mounting hardware 40-45 FPM	400700-5X
S-Pack Flasher Module for 400700 Relay, w/o mounting hardware 50-65 FPM	400700-18X
Rectifier Assembly for Relay 400800 and 400801, w/mounting hardware	400800-1X

TYPE ST1 AND ST2 RELAY COILS ORDERING INFORMATION

To Order: Specify Part Number and Coil Resistance.

Resistance Ohms	ST1 or ST2 Relay(s) Used On	Part Number
250	400000, 400004, 400020, 400023, 400025	420051-1X
2	400010, 400011	420051-2X
100	400021, 400800, 400801, 400802	420051-3X
450	400003, 400022, 400300, 400301, 400302	420051-4X
0.2	400301	420051-5X
0.12	400300	420051-6X
220	400100, 400602	420051-7X
194	400200, 400210, 400211, 400212, 400400	420051-8X
135	400601, 400604	420051-9X
1225	400600	420051-10X
0.064	400601	420051-11X
0.068	400600, 400602	420051-12X
60	400700	420051-13X
250	400500, 400502, 400505, 400520	420051-15X
400	400516	420051-16X
1	400510, 400511, 400512, 400515	420051-17X
31.5	400501	420051-18X
42	400001	420051-19X
900	400002	420051-20X
40	400220 (Top)	420051-21X
40	400220 (Bottom)	420051-22X
500	400503	420051-23X
0.9	400012, 400013	420051-24X
300	400101	420051-25X
50	400504	420051-26X
100	400021 (Bottom)	420051-28X
12	400221 (Top)	420051-29X
12	400221 (Bottom)	420051-30X
0.69	400302	420051-31X
460	400213	420051-32X
194	400530	420051-33X
800	*450300	420051-34X
800	400540	420051-35X
0.125	400604	420051-36X
250	*450000, 450900, 450901	420051-37X
260	*450200	420051-42X
175	*450500, 450501	420051-43X
62.5/.070	*450902	420051-44X
250	400900	420051-45X
26	400901	420051-46X
100	400950	420051-47X
40	400951	420051-48X
250	451000	420051-49X
400	*450502	420051-50X
1000	400517	420051-51X
0.67 (Local)	*450993-Vane	420051-56X
.4 (Track)	*450993-Vane	420051-57X
144 (Local)	*450992, 450994- Vane	420051-58X
5 (Track)	*450994- Vane	420051-59X
.524 (Track0	*450992- Vane	420051-60X
25	400014	420051-88X
22	400952	420051-89X

*ST2

CONTACT STACKS FOR ST1 AND ST2 RELAYS

To Order: Specify Description and Part Number.

Relay	Contact Stack Description	Part Number	Relay	Contact Stack Description	Part Number
400000	2FB	420052-1X	400502	2FB	420052 -1X
400001	2FB	-1X	400502	2F-1B	-2X
400002	2FB	-1X	400503	2FB	-1X
400002	2F-1B	-2X	400503	2F-1B	-2X
400003	2FB	-1X	400504	2FB	-1X
400003	2F-1B	-2X	400504	2F-1B	-2X
400004	2FB	-1X	400505	2FB (HD)	-3X
400004	2F-1B	-2X	400510	2FB	-1X
400010	2FB	-1X	400510	2F-1B	-2X
400011	2FB	-1X	400511	2FB	-1X
400011	2F-1B	-2X	400512	2FB	-1X
400012	2FB	-1X	400515	1F-2B	-8X
400012	2F-1B	-2X	400515	2FB	-1X
400013	2FB	-1X	400516	2FB	-1X
400014	2FB	-1X	400520	2F-1B (EHD)	-7X
400014	2F-1B	-2X	400530	2FB	-1X
400015	2FB	-1X	400540	2FB	-1X
400015	2F-1B	-2X	400600	2B	-10X
400017	2FB	-1X	400601	2 (CBO)	-9X
400020	2FB (HD)	-5X	400602	2 (CB0)	-9X
400020	2F-1B (HD)	-6X	400604	2 (CB0)	-9X
400021	2B (HD)	-12X	400700	2FB (FLASHER)	-4X
400022	2FB (HD)	-5X	400800	2FB (HD)	-3X
400022	2F-1B (HD)	-6X	400801	2FB (HD) (SIL-CARB)	-13X
400022	2FB (HD)	-3X	400802	2FB (HD)	-3X
400025	2FB (EHD)	-4X	400900	1NR	-24X
400100	2FB	-1X	400901	1NR (SIL.PLAT.)	-25X
400101	2FB	-1X	400951	1FB (TUNGSTEN)	-16X
400101	2F-1B	-2X	400952	1 NR (SIL. PLAT.)	-25X
400200	2FB	-1X	400953	2FB (SIL.-PLAT.)	-19X
400210	2FB	-1X	400953	2FB (TUNGSTEN)	-20X
400211	2FB	-1X	400954	2FB (SIL. PLAT.)	-26X
400211	2F-1B	-2X	*450000	2FB	-1X
400212	2FB	-1X	*450200	2FB	-1X
400212	2F-1B	-2X	*450300	2FB	-1X
400213	2FB	-1X	*450300	2F-1B	-2X
400220	1F-2B	-8X	*450500	2FB	-1X
400221	2FB	-1X	*450501	2FB	-1X
400300	2FB	-1X	*450501	2F-1B	-2X
400301	2FB	-1X	*450502	2FB	-1X
400302	2FB	-1X	*450502	2F-1B	-2X
400400	2FB	-1X	450992	1F-1B	-28X
400400	2F-1B	-2X	450993	1F-1B	-28X
400500	2FB	-1X	450994	1F-1B	-28X
400501	2FB	-1X	Blank Stack		-3

*ST2

TYPE ST1 AND ST2 RELAY SLUGS

To Order: Specify Description and Part Number.

Description	Dimensions	Part Number
Slug, Copper Nickel Plated	.562" ID x 2.453"	420051-2
Slug, Copper Nickel Plated	.578" ID x 4.968"	420051-3
Slug, Aluminum	1.628" ID x 2.453"	420051-4
Slug, Aluminum	.753" ID x 4.968"	420051-5
Slug, Copper	1.628" ID x 2.453"	420051-6
Slug, Copper Nickel Plated	.753" ID x 4.968"	420051-7
Slug, Copper	.753" ID x 1.065"	420051-8

MODEL ST1 & ST2 RELAY SOCKET ASSEMBLIES AND TERMINALS

INTRODUCTION

Safetran Type ST Plug-In Relay Sockets are designed for mounting of Model ST Relays, as well as other manufacturer's relays. These socket assemblies consist of a socket, two relay mounting guide rods, current (1) test terminal, and necessary mounting hardware. These sockets can be furnished with either solder- or crimp-type terminals.

ORDERING INFORMATION

Socket Assemblies

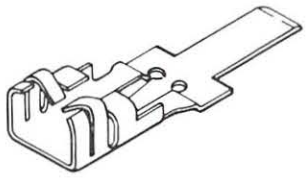
To Order: Specify Description and Part Number.

Description	Part Number	
	Single Socket	Double Socket
Relay Socket w/1 Test Post, Less Terminals	420000-40X	452000-40X
Above w/20-16 Crimp-Type Terminals	420000-41X	452000-41X
Above w/14-10 Crimp-Type Terminals	420000-43X	452000-43X
Above w/Solder-Type Terminals	420000-42X	452000-42X
Relay Socket w/1 Test Post, Voltage Test Post, Less Terminals	420000-75X	452000-75X
Above w/20-16 Crimp-Type Terminals	420000-76X	452000-76X
Above w/14-10 Crimp-Type Terminals	420000-78X	452000-78X
Above w/Solder-Type Terminals	420000-77X	452000-77X

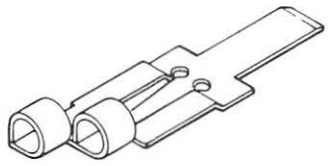
NOTE: 22 terminals supplied with single socket, 40 terminals supplied with double socket.

Terminals And Crimper

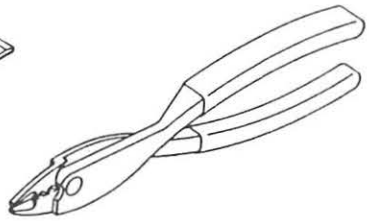
To Order: Specify Description and Part Number.



Solder-Type



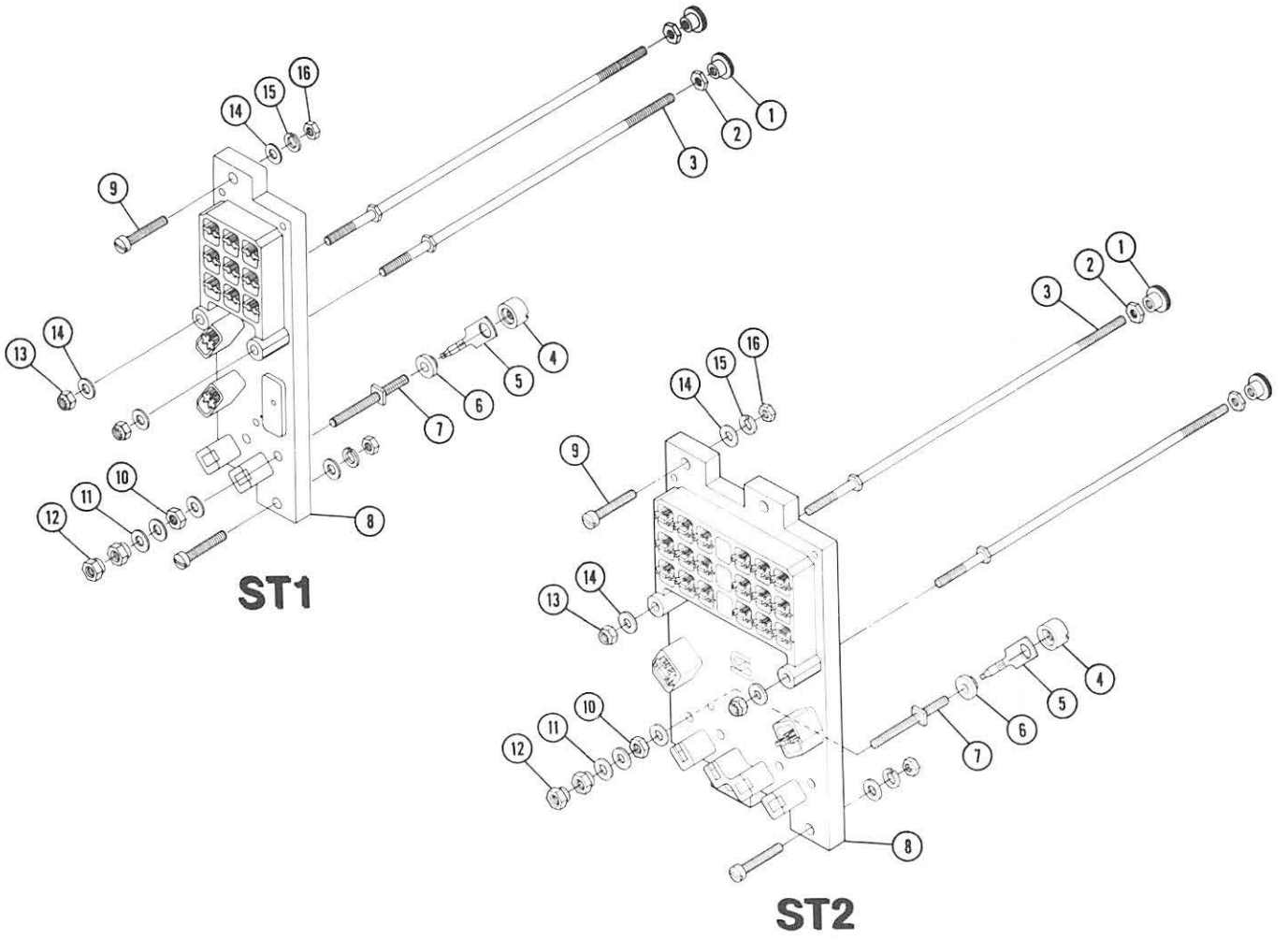
Crimp-Type



Crimper

Description	Part Number
Terminal, Solder-Type for Sockets	420000-48
Terminal, Crimp-Type No. 16-20 AWG for Sockets	420000-49
Terminal, Crimp-Type No. 10-14 AWG for Sockets	420000-50
Crimper	420000-85

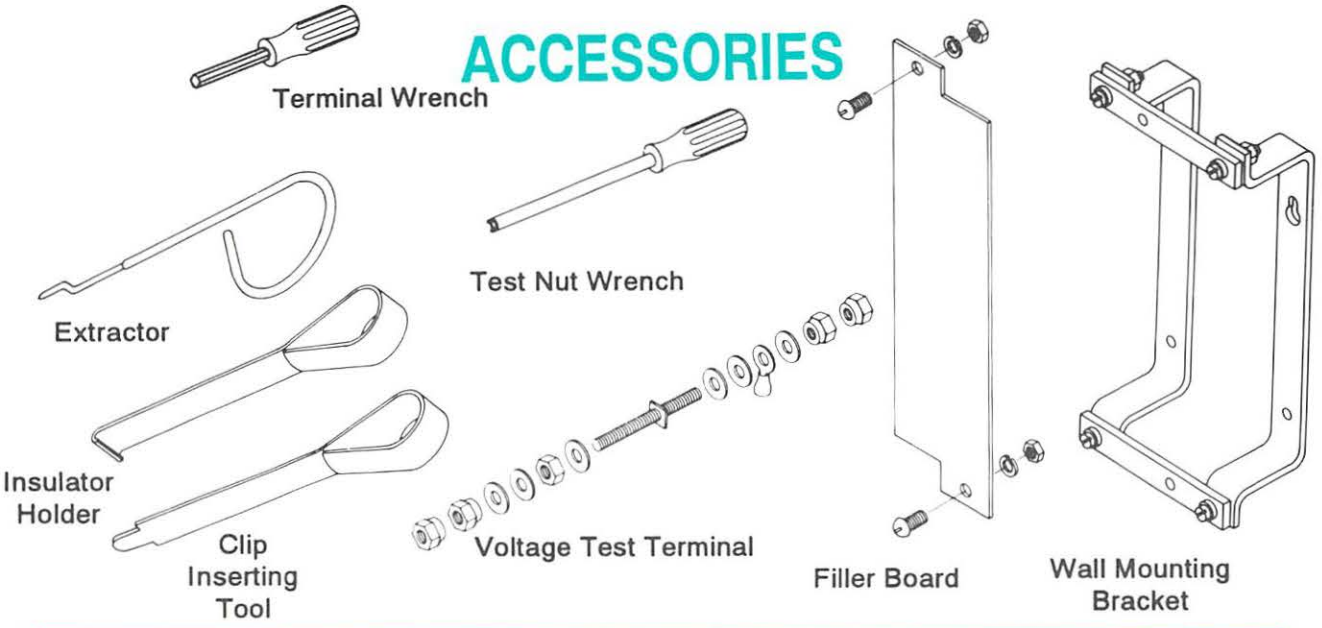
MODEL ST1 & ST2 RELAY SOCKETS REPLACEMENT PARTS



To Order: Specify Description and Part Number

Item Number	Description	Single		Double	
		Qty. Req'd	Part Number	Qty. Req'd	Part Number
1	Nut, Knurl	2	420000-67	2	420000-67
2	Nut, Hold Down Stud	2	420000-66	2	420000-66
3	Stud, Hold Down	2	420000-63	2	420000-63
4	Nut, Socket	1	420000-65	1	420000-65
5	Connector, Terminal	1	420000-64	1	420000-64
6	Bushing, Insulation	1	024620-12	1	024620-12
7	Post, Current Test	1	420000-55	1	420000-55
8	Socket Assy.	1	420000-60X	1	452000-60X
9	Machine Screw, 1/4"	2	420000-68	4	420000-68
10	Nut, Clamp	1	023832	1	023832
11	Washer, Beveled	3	023834	3	023834
12	Nut, Binding	2	023831	2	023831
13	Nut, Esna, 1/4"-28	2	420000-69	2	420000-69
14	Washer, Flat, 1/4"	4	420000-70	6	420000-70
15	Washer, Spring	2	420000-71	4	420000-71
16	Nut, Hex, 1/4"	2	420000-72	4	420000-72

ACCESSORIES



Available for use with the Type ST1 & ST2 plug-in relay sockets are a voltage test terminal, filler board, and wall mounting brackets.

The test terminal post consists of terminal post, crimp type test terminal, and necessary hardware.

The filler boards are for use in mounting terminals, rectifiers, diodes, etc., and are of aluminum construction.

The wall mounting brackets are for the mounting of relay sockets to the wall of instrument housings. These brackets, designed for 1 to 4 relay sockets, will also accommodate other manufacturers' sockets. These brackets alleviate the need to install large relay racks when installing only a few plug-in relays. Necessary hardware for mounting these brackets on the wall of instrument housing is provided.

The extractor is constructed of steel wire covered with insulating tubing. It is used for removing terminals and clips from Type ST1 & ST2 relay plugboards.

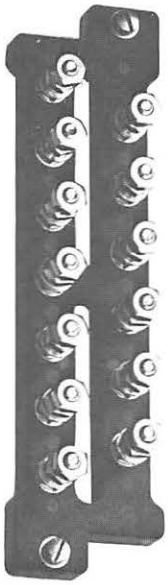
The insulator holder is for holding insulators in plugboards while inserting clips, and clip inserting tool is for inserting clips into engagement with insulators.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Wall Mounting Bracket for one ST1 Relay	420000-51X
Wall Mounting Bracket for two ST1 or one ST2 Relay	420000-52X
Wall Mounting Bracket for two ST1 and one ST2 Relays or two ST2 or four ST1 Relays	420000-53X
Shelf Mounting Bracket for one ST1 Relay	420000-54X
Shelf Mounting Bracket for two ST1 or ST2 Relay	420000-55X
Shelf Mounting Bracket for one ST1 and one ST2 Relay or three ST1 Relays	420000-56X
Filler Plate Kit	420000-58X
Voltage Test Post Kit	420000-46X
Terminal Wrench, 1/2 inch Hex Insulated	032619-3X
Test Nut Wrench	032619-22X
Extractor Tool	032619-25
Insulator Tool	032619-26
Clip Inserting Tool	032619-27

TERMINAL BLOCKS



13 Way
Terminal Block

14 Way
Terminal Block

Safetran 13 Way and 14 Way Black Phenolic Terminal Blocks provide convenient terminal mounting on existing relay racks. Beveled washer AAR# 14.1.11-8 and clamp nut AAR# 14.1.11-7 are assembled on posts. Balance of washers and binding nuts AAR# 14.1.11-6 are furnished in a separate plastic bag. For additional terminal block hardware, see page K-1-6.

ORDERING INFORMATION

To Order: Specify Description and Part Number

Description	Center to Center Dimension of Terminal Posts in Inches	Part Number
13 Way Terminal Block	1-1/6 Vertical Spacing 1-3/8 Horizontal Spacing	051883-26X1
14 Way Terminal Block	1-1/6 Vertical Spacing 1-1/4 Horizontal Spacing	051883-18X1

Safetran ST Relays
Cross Reference List

Safetran Relay	GRS Relay	US&S Relay	Contact Arrangement	Type	Coil Resistance-Ohms	Date
400000	A62-262		6FB	Neutral	500	5/88
400001	A62-295		6FB	Neutral	84	5/88
400002	A62-318		4FB-2F-1B	Neutral	1800	5/88
400003	A62-308		4FB-2F-1B	Neutral	900	5/88
400004	A62-277		4FB-2F-1B	Neutral	500	5/88
400010	A62-261		6FB	Neutral	4	5/88
400011	A62-276		4FB-2F-1B	Neutral	4	5/88
400012	A62-275		4FB-2F-1B	Neutral	1.8	5/88
400013	A62-260		6FB	Neutral	1.8	5/88
400014	A62-315		4FB-2F-1B	Neutral	50	5/88
400015	A62-319		4FB-2F-1B	Neutral	100	5/88
400016			2FB-5F-1B	Neutral	450/450	3/92
400017	A62-296		6FB	Neutral	900	1/92
400020	A62-310		4FB-2F-1B (HD)	Neutral	500	5/88
400021	A62-205		2B-HD-2FB	Neutral — Lamp Control	200	5/88
400022	A62-311		4FB-2F-1B (HD)	Neutral	900	5/88
400023	A62-580		6FB (HD)	Neutral	500	4/94
400025	A62-427		4FB (HD)	Neu. — Sw. Control	500	5/88
400027	A62-309		4FB-2F-1B (HD)	Neutral	350	10/94
400028	A62-557		6FB	Neutral	60	10/94
400100	A62-345		6FB	Slow Pickup	220	5/88
400101	A62-341		4FB-2F-1B	Slow Pickup	300	5/88
400200	A62-360		4FB	Slow Release	194	9/91
400210	A62-359		6FB	Slow Release	194	5/88
400211	A62-357		4FB-2F-1B	Slow Release	194	5/88
400212	A62-358		4FB-2F-1B	Slow Release	194	5/88
400213	A62-353		2FB	Slow Release	460	4/94
400220	A62-380		2F-4B	Slow Release	80	5/88
400221	A62-365		2FB	Slow Release	24	5/88
400300	A62-221		4FB	Light Out (Relay Only)	450/.12	5/88
400301	A62-231		6FB	Light Out (Relay Only)	450/.2	5/88
400302	A62-217		4FB	Light Out (Relay Only)	450/.069	5/88
400300-1X	A53-100			LOR Rectifier		5/88
400303	A62-211		4FB	Light Out	.24	11/94
400400	A62-350		4FB-2F-1B	Slow PU & DA	194	5/88
400500	A62-125		6FB	Biased Neutral	500	5/88
400501	A62-140		6FB	Biased Neutral	63	5/88
400502	A62-122		4FB-2F-1B	Biased Neutral	500	5/88
400503	A62-552		2FB-4F-2B	Biased Neutral	1000	5/88
400504	A62-126		4FB-4F-1B	Biased Neutral	100	5/88
400505			6FB (HD)	Biased Neutral	500	5/88
400507	A62-637		5F-4B	Biased Neutral	4	10/94
400508	A62-639		5F-4B	Biased Neutral	.5	10/94
400510	A62-120		4FB-2F-1B	Biased Neutral	2	5/88
400511	A62-118		4FB	Biased Neutral	.5	12/91
400512	A62-654		6FB	Biased Neutral	2	5/88
400515	A62-633		5F-4B	Biased Neutral	.5	11/93

Safetran Relay	GRS Relay	US&S Relay	Contact Arrangement	Type	Coil Resistance-Ohms	Date
400516		*322500-702	6FB	Biased Neutral	800	11/94
400517			4FB	Biased Neutral	2000	7/95
400520	A62-429		2F-2B (EHD)	Biased Sw. Control	500	4/94
400530		*322503-702	6FB	Biased Slow Release	194	8/90
400540			6FB	Biased Slow Pickup	800	6/91
400600	A62-432		2B (EHD)	Switch Overload	.068/1225	5/88
400601	A62-430		2CBO	Switch Overload	.064/135	5/88
400602	A62-545		2CBO	Switch Overload	.068/220	5/88
400604			2CBO	Switch Overload	.125/135	5/88
400605	A62-431		2CBO	Switch Overload	.064/135	2/95
400700	A62-577		4FB	Flasher Relay	60	5/88
400700-X	A62-195		4FB	Relay W/Flasher, 40-45 Flashes per Min	60	5/88
400700-7X	A62-197		4FB	Relay W/Flasher, 50-64 Flashes per Min	60	5/88
400700-1X	P62-769			Flasher Only (40-45 Flashes)		6/95
400700-8X	P62-784			Flasher Only (50-64 Flashes)		6/95
400800	A62-406		6FB (HD)	Power Transfer (Relay)	100/100	5/88
400800-X				400800 Relay & Rectifier		5/88
400801	A62-579		6FB (HD)	Power Transfer (Relay)	100/100	5/88
400801-X				400801 Relay & Rectifier		5/88
400802	A62-407		6FB (HD)	Power Transfer (Relay)	100/100	5/88
400802-X				400802 Relay & Rectifier		5/88
400800-1X	A53-541			Rectifier Only for P.T. Relays		5/88
400900	A62-247		4NR	Magnetic Stick	500	7/90
400901	A62-659		2NR	Magnetic Stick	26/26	1/94
400950	A62-610		2FB	Code Responsive	200	
400951	A62-622		4FB Tungsten	Code Responsive	80	7/91
400952	A62-600		2NR	Code Responsive	22/22	11/95
400953	A62-598		2FB-2FB SL-Plat-Tungsten	Code Responsive	80	11/95
400954			4FB Silv.-Plat.	Code Responsive	80	4/95
400955	A62-157		4FB Silv.-Plat.	Code Responsive	80	11/95
450000	A62-330		12FB	Neutral	500	1/94
450200	A62-607		12FB	Neutral Slow Release	260	6/89
450300		*322551-701	8FB-4F-2B	Biased Slow Pickup	800	7/92
450500	A62-150		12FB	Biased Neutral	350	6/89
450501	A62-145		8FB-4F-2B	Biased Neutral	350	11/95
450502		*322554-702	8FB-4F-2B	Biased Neutral	800	8/90
450900	A62-609		6NR	Polar	500	11/95
450901	A62-391		4FB-4NR	Polar	500	11/95
450902	A62-585		4NR-2FB-2F	Polar	125/24	3/91
450992	A62-547		4F-4B	Vane-60Hz		11/95
450993	A62-597		4F-4B	Vane-100Hz		11/95
450994	A62-548		2F-2B	Vane-60Hz		11/95
451000-X	A62-627		2FB-3F-2B	Vital Timer	500	6/91

*Will require socket assembly (see catalog section I-1-11)

Safetran Systems Corporation

Inter-office Correspondence

TO: BULLETIN DISTRIBUTION

FROM: D.K. YOPP

SUBJ: ST RELAY SPECIFICATION SHEETS

DATE: OCTOBER 1, 1985

Enclosed is a set of all specification sheets for ST Relays.

Included are the new relay spec sheets:

400013, Neutral 6FB, 1.8 Ohm
400014, Neutral 4FB-2F-1B, 50 Ohm
400021, Neutral 2B HD, 200 Ohm for Lamp Control
400022, Neutral 4FB-2F-1B HD, 900 Ohm –
400212, Neutral Slo Release (2.8 Sec) 4FB-2F-1B, 194 Ohm
400221, Neutral Slo Release (0.4 Sec) 2FB, 24 Ohm
400302, Neutral Light-Out, 4FB, 450/.069 Ohm
400511, Biased Neutral High PU/DA, 4FB, .5 Ohm
400801, Neutral 6FB HD Power Transfer, 100/100 Ohm

Other sheets have been updated due to changes in part numbers. Those with changes will bear the 8/85 revision date on the back page.

These specification sheets supersede all previous specification sheets distributed.

We have extra sheets available if you require. We also have the updated cross-reference sheets to GRS Type B which you should have already received.

D. Kevin Yopp

Enclosures

Safetran Systems Corporation

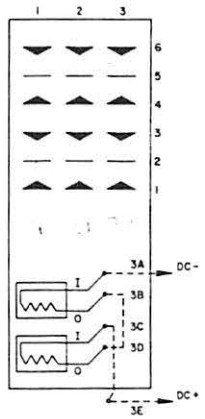
Part Number **400000**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
6FB Contacts, 500 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		250 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.05 Volts Maximum
	Current		12.1 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.85 Volts Minimum
	Current		5.7 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

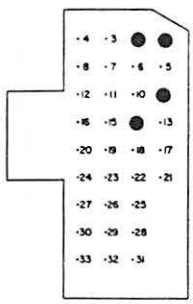
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-9-14

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

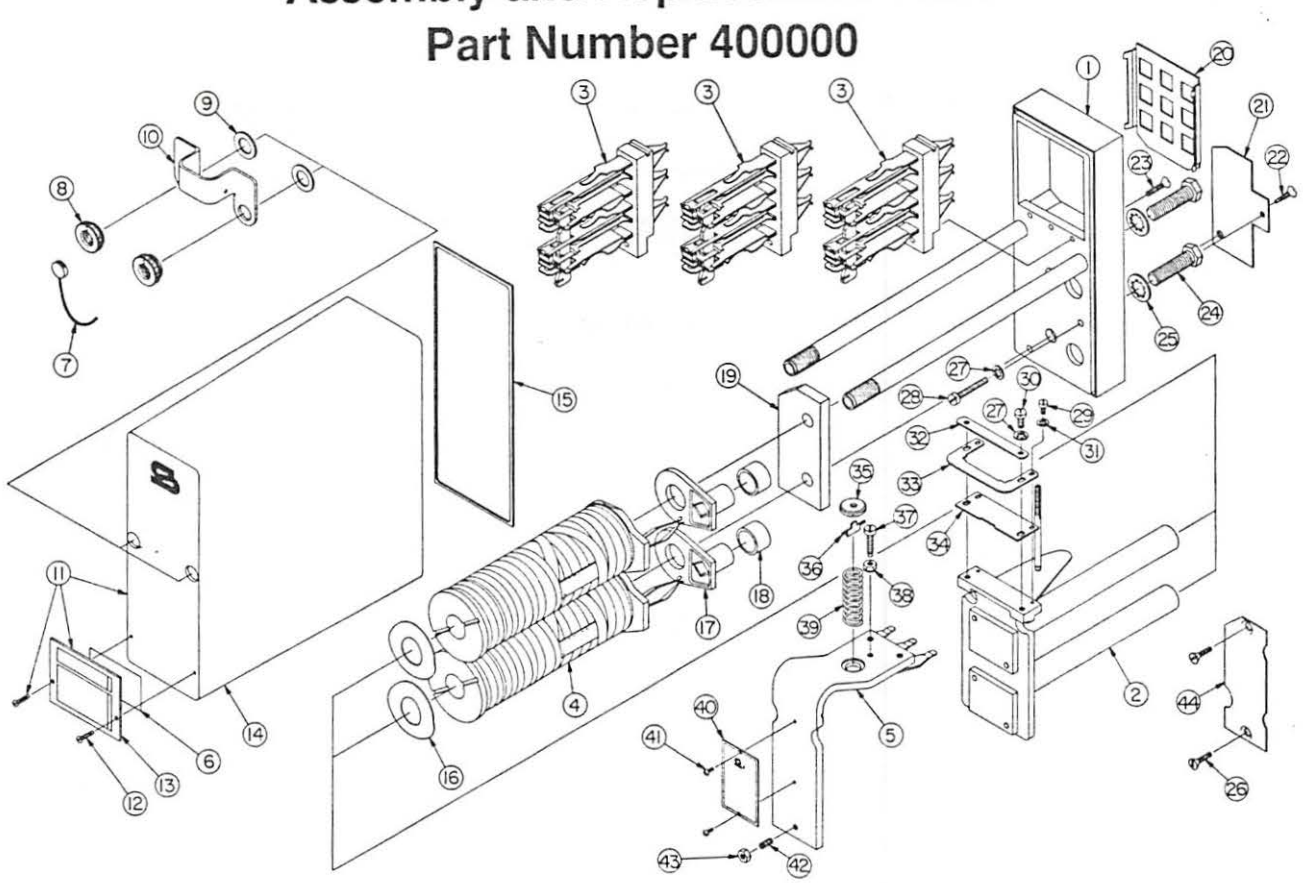
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400000

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400000



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I. 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
3	Stack, 2FB Contact	3	420052-1X				
4	Coil Assembly, 250 Ohm	2	420051-1X	27	Washer, Spring Lock, I. #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I. #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-7	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-19
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-9				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-39
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12				

I&M # 410000-10
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

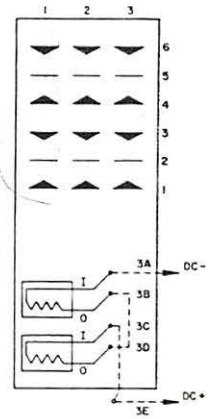
Part Number **400001**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
6FB Contacts, 84 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		25-30 mADC
	Resistance/Tolerance		42 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		1.64 Volts Maximum
	Current		19.5 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.71 Volts Minimum
	Current		8.4 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

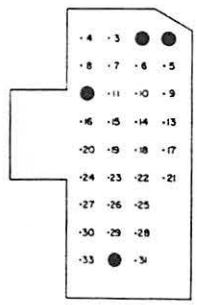
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-12-32

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

Field Requirements

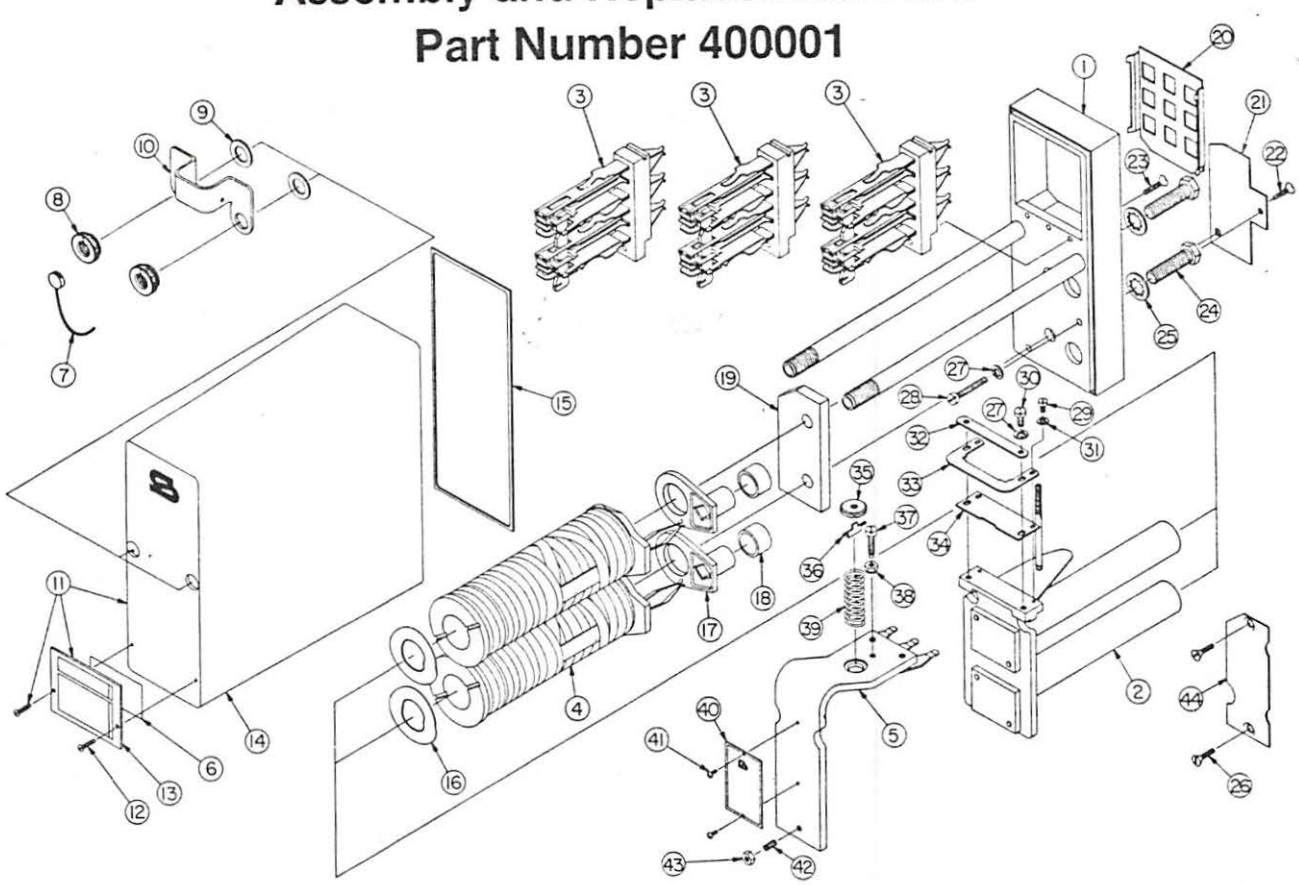
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400001

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400001



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-3X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
3	Stack, 2FB Contact	3	420052-1X				
4	Coil Assembly, 42 Ohm	2	420051-19X	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-42	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051-8	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-20
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-10				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-40
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12				

Safetran Systems Corporation
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I&M # 410000-11
Revised 6/83

Safetran Systems Corporation

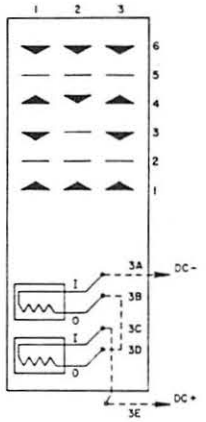
Part Number **400002**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
4FB-2F-1B Contacts, 1800 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		900 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		8.46 Volts Maximum
	Current		4.7 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.7 Volts Minimum
	Current		1.5 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

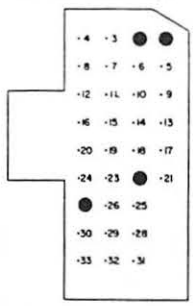
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-22-27

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

Field Requirements

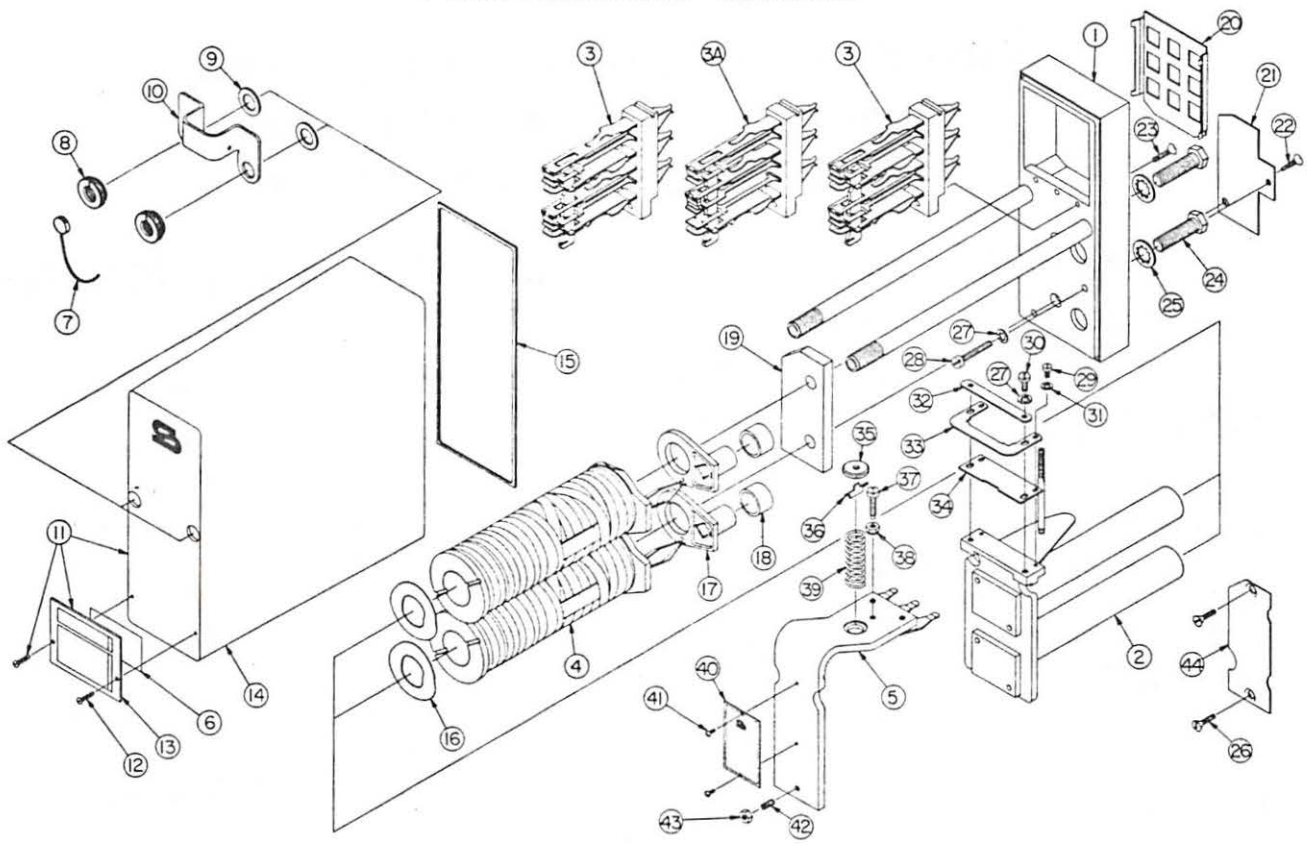
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400002

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400002



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-3X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 900 Ohm	2	420051-20X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	2	420053-42	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	2	420051-8	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	2	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-4
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-21
21	Plate, Code	1	420050-11	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-41

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I&M # 410000-12
Revised 6/83

Safetran Systems Corporation

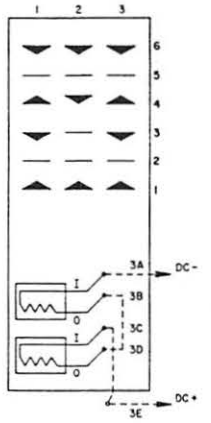
Part Number **400003**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
4FB-2F-1B Contacts, 900 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		450 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		7.56 Volts Maximum
	Current		8.4 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		3.6 Volts Minimum
	Current		4 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

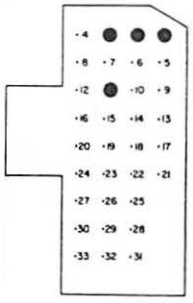
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-3-11

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

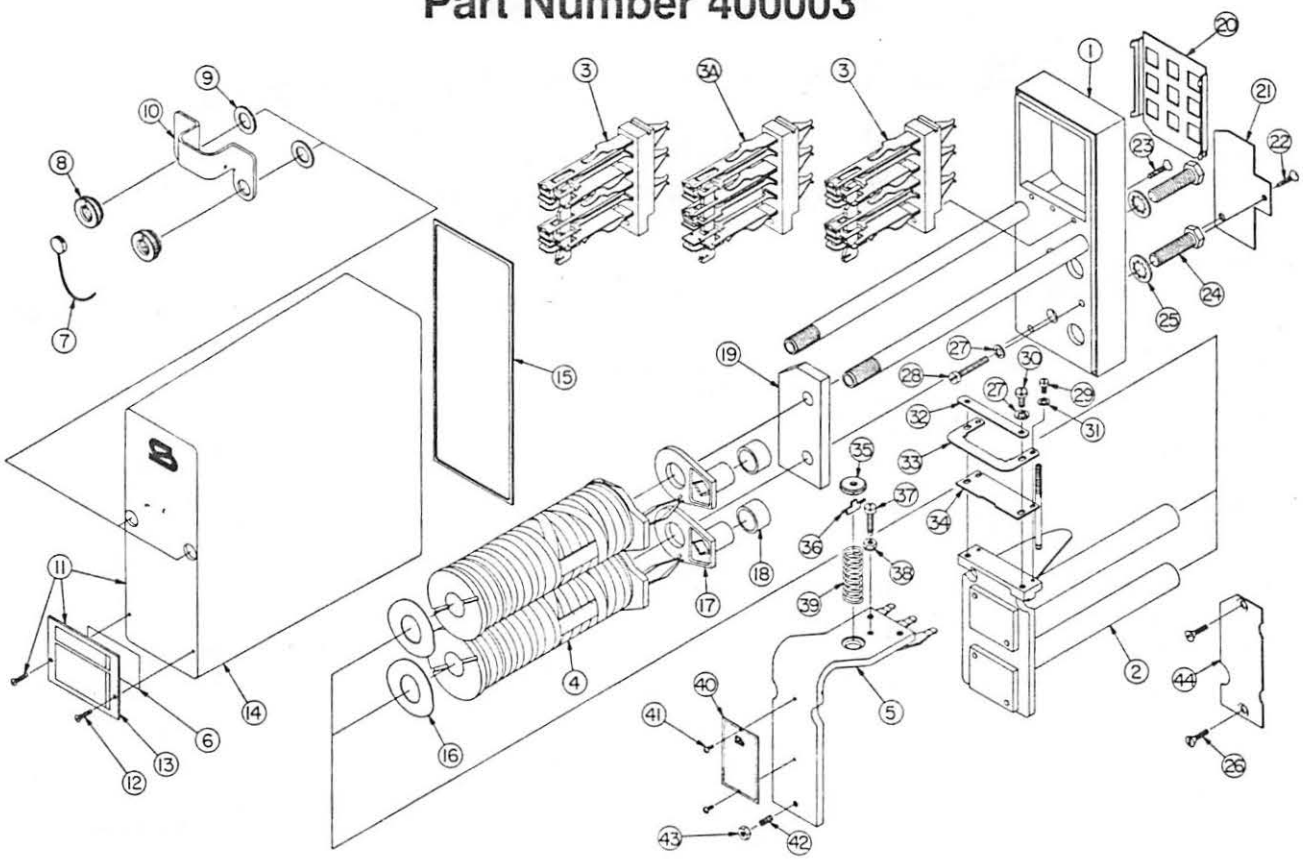
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400003

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400003



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 450 Ohm	2	420051-4X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	2	420053-7	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	2	420051-8	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	2	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-4
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-22
21	Plate, Code	1	420050-503	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-43

Safetran Systems Corporation
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I&M # 410000-13
Revised 8/85

Safetran Systems Corporation

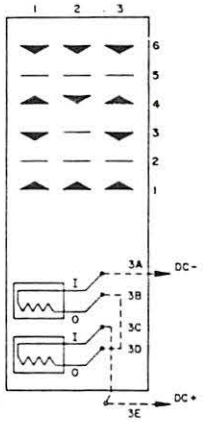
Part Number **400004**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
4FB-2F-1B Contacts, 500 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		250 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.05 Volts Maximum
	Current		12.1 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.85 Volts Minimum
	Current		5.7 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

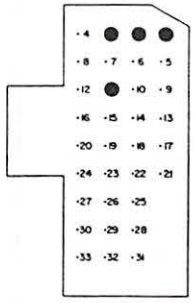
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-3-11

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

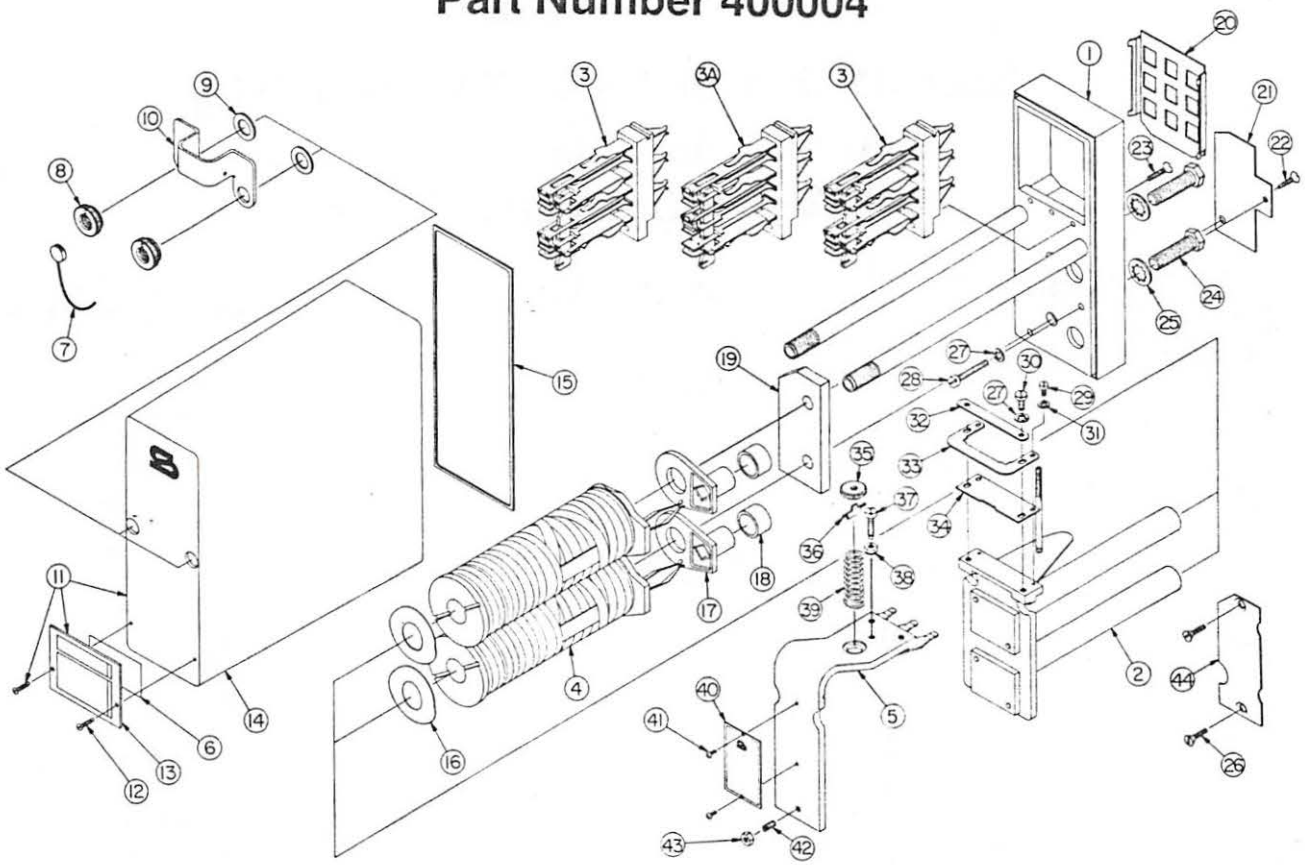
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400004

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400004



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 250 Ohm	2	420051-1X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	2	420053-7	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	2	420051	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	2	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-4
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-23
21	Plate, Code	1	420050-13	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-43

I&M # 410000-14
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
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Safetran Systems Corporation

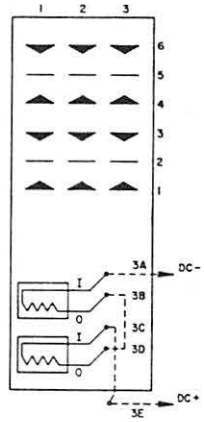
Part Number **400010**

Specification for Type ST Plug-in Relay
Neutral Track Relay
6FB Contacts, 4 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		100-120 mADC
	Resistance/Tolerance		2 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		.356 Volts Maximum
	Current		89 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.208 Volts Minimum
	Current		52 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

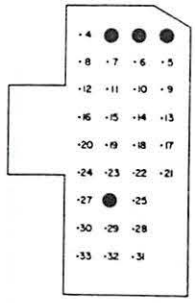
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-3-26

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

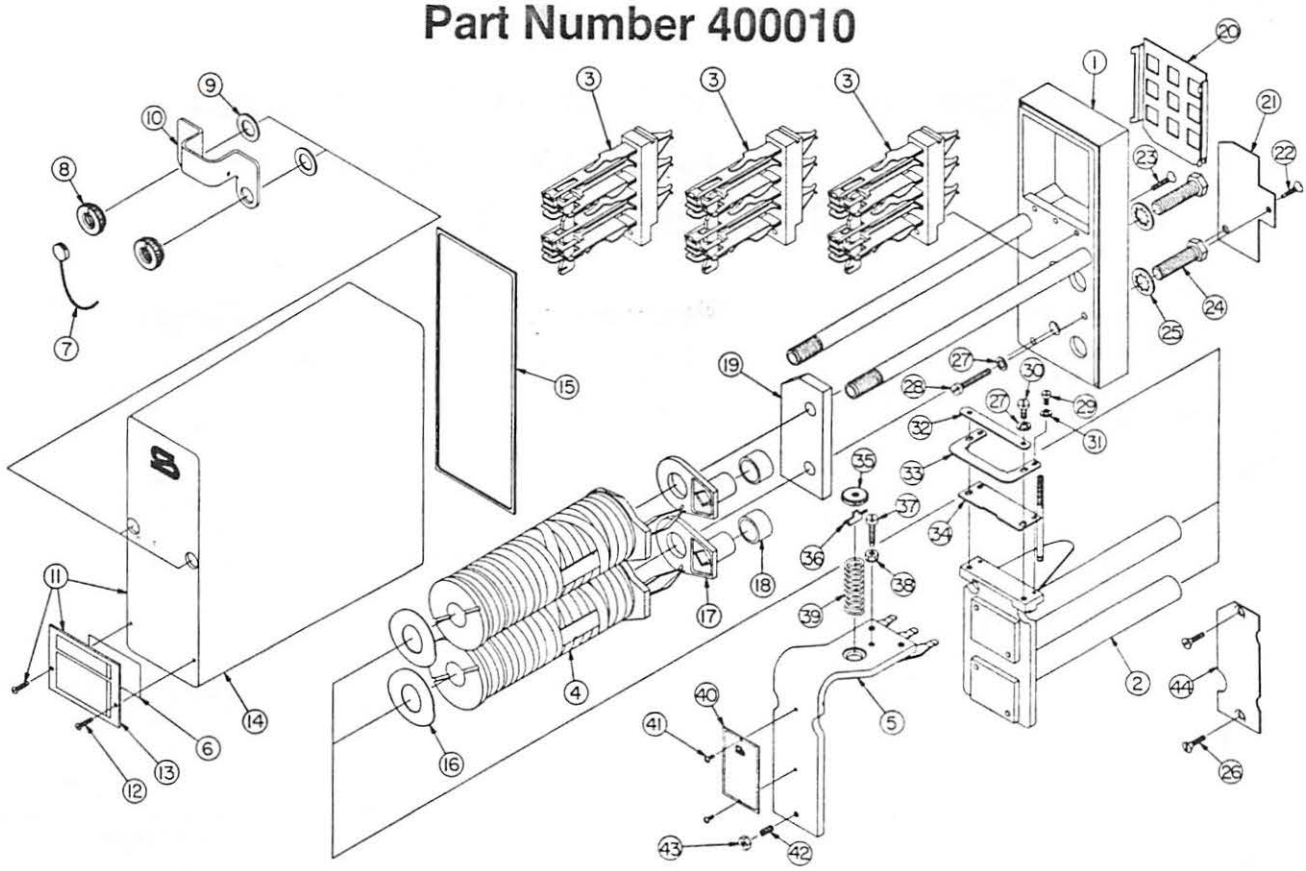
Drop Away Value — Not less than 85% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400010

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400010



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I. 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
3	Stack, 2FB Contact	3	420052-1X				
4	Coil Assembly, 2 Ohm	2	420051-2X	27	Washer, Spring Lock, I. #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I. #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-7	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-24
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-14				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-44
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12				

I&M # 410000-15
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

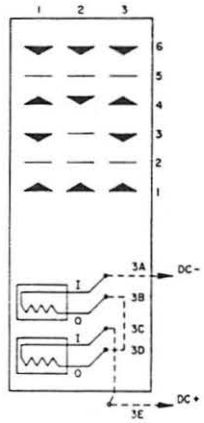
Part Number **400011**

Specification for Type ST Plug-in Relay
Neutral Track Relay
4FB-2F-1B Contacts, 4 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		100-120 mADC
	Resistance/Tolerance		2 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		.356 Volts Maximum
	Current		89 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.208 Volts Minimum
	Current		52 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

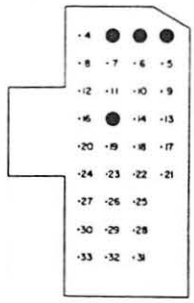
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-3-15

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

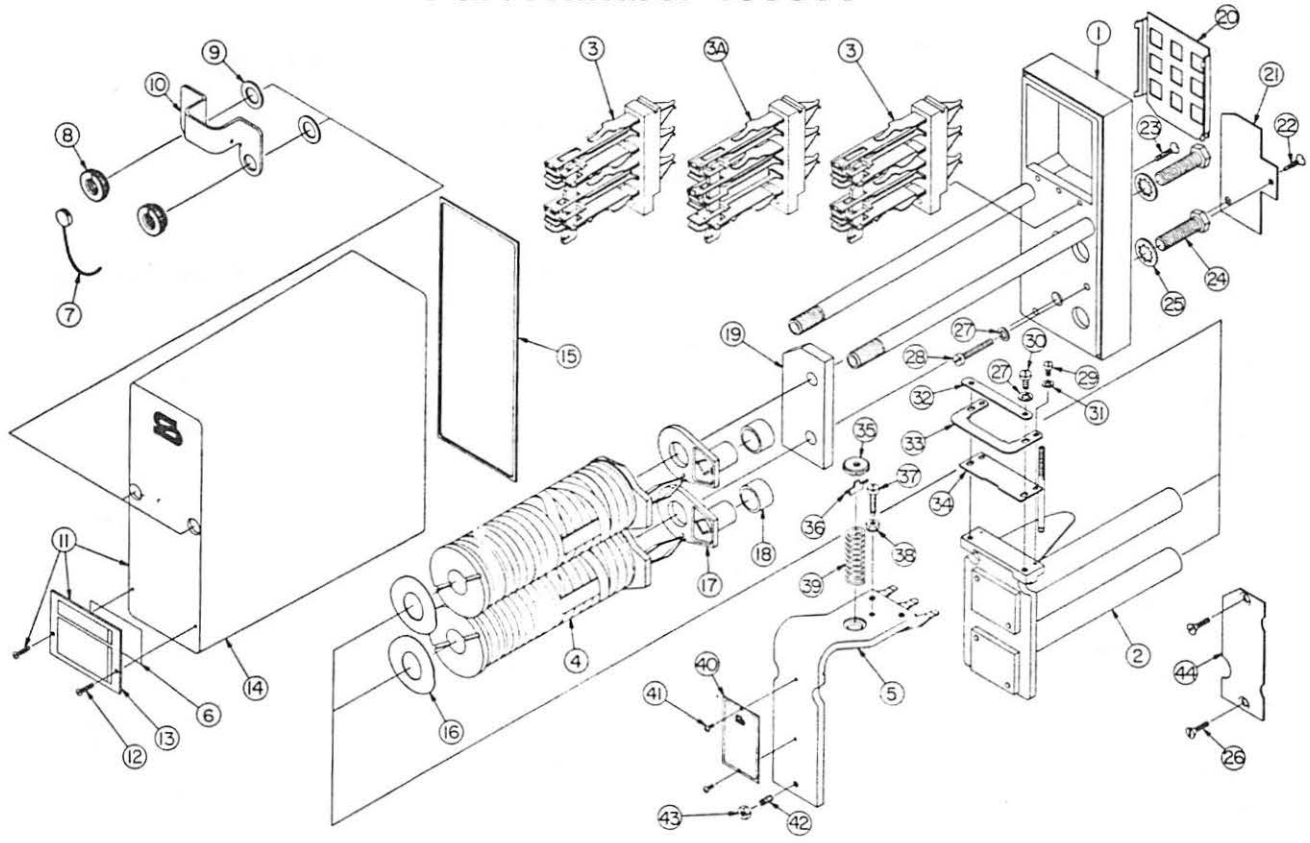
Drop Away Value — Not less than 85% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400011

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400011



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 2 Ohm	2	420051-2X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	2	420053-7	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	2	420051	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	2	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-4
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-25
21	Plate, Code	1	420050-15	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-45

I&M # 410000-16
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

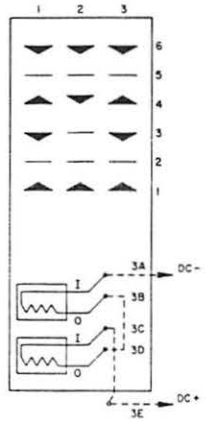
Part Number **400012**

Specification for Type ST Plug-in Relay
Neutral Track Relay
4FB-2F-1B Contacts, 1.8 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		150-160 mADC
	Resistance/Tolerance		0.9 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		.234 Volts Maximum
	Current		130 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.135 Volts Minimum
	Current		75 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

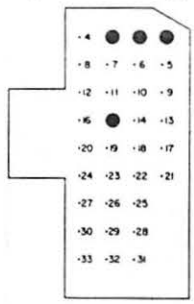
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-3-15

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

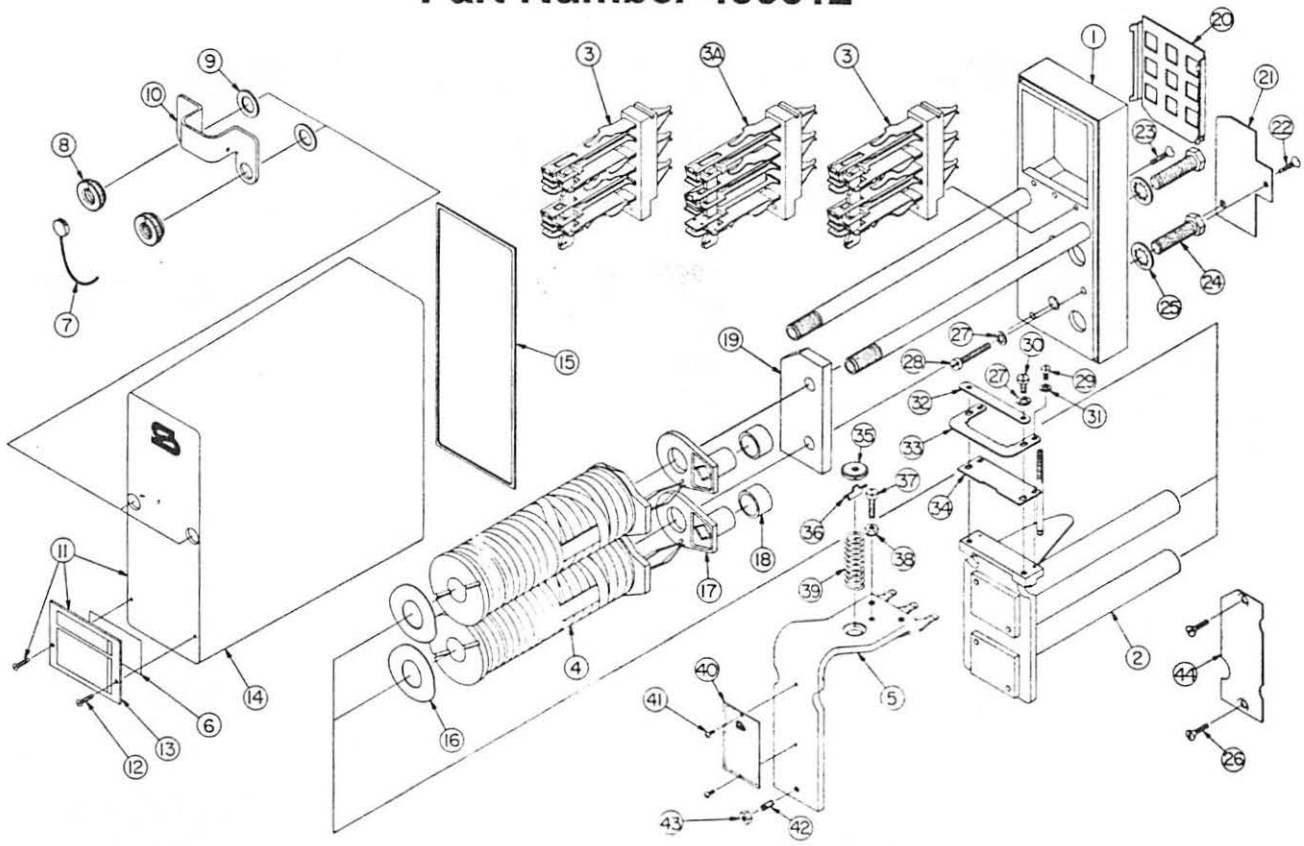
Drop Away Value — Not less than 85% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400012

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400012



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 0.9 Ohm	2	420051-24X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	2	420053-7	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	2	420051	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	2	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-4
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-51
21	Plate, Code	1	420050-504	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-45

I&M # 410000-34
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

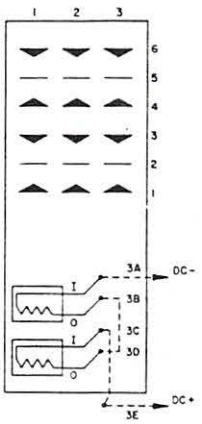
Part Number **400013**

Specification for Type ST Plug-in Relay
Neutral Track Relay
6FB Contacts, 1.8 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		150-160 mADC
	Resistance/Tolerance		.9 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		.234 Volts Maximum
	Current		130 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.140 Volts Minimum
	Current		78 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

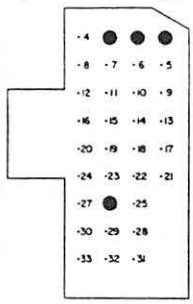
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-3-26

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

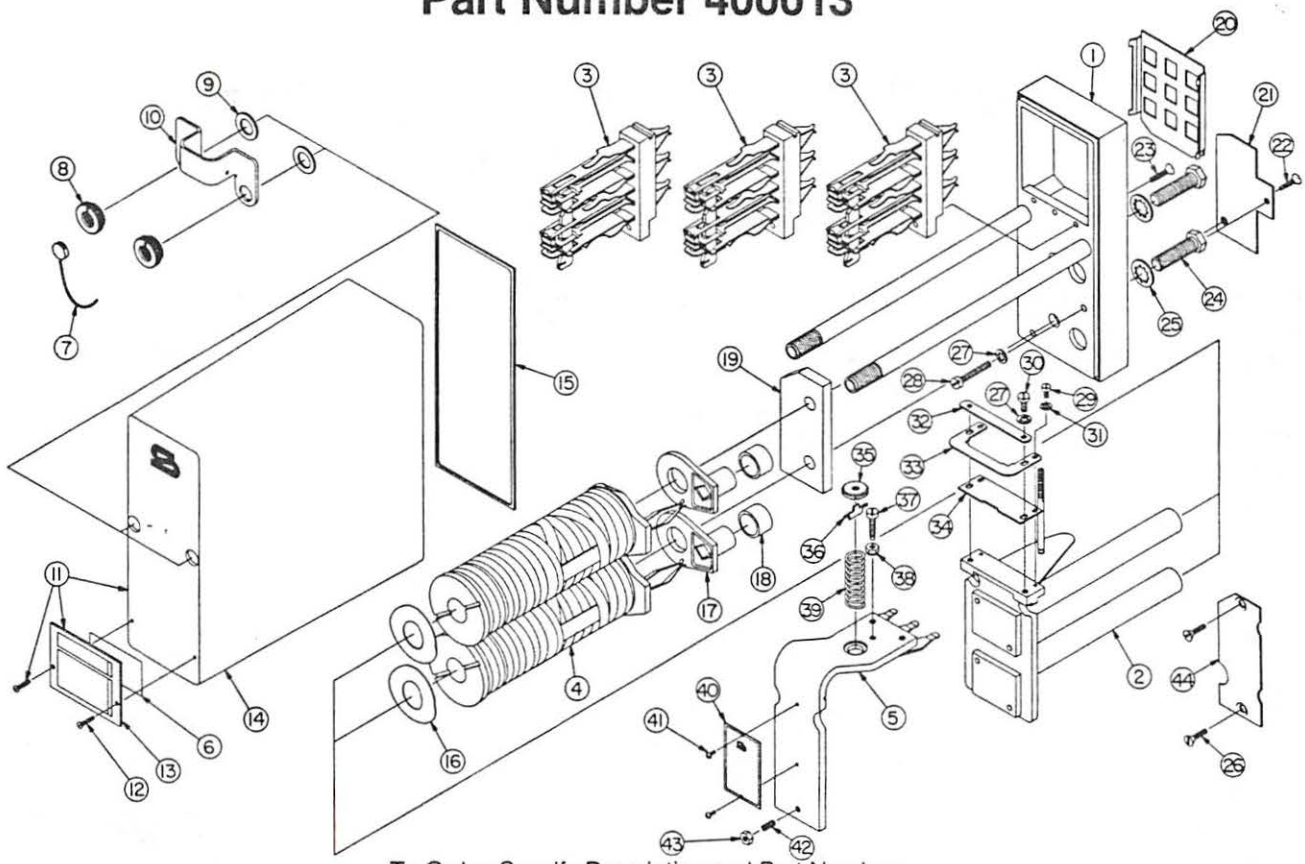
Drop Away Value — Not less than 85% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400013

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400013



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
3	Stack, 2FB Contact	3	420052-1X				
4	Coil Assembly, .9 Ohm	2	420051-24X	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-7	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-60
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-505				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-44
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12				

I&M # 410000-45
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

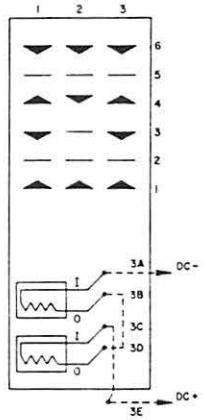
Part Number **400014**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
4FB-2F-1B Contacts, 50 Ohm

	Characteristic		Original Requirements
Coils	Nominal V or I		50 mADC
	Resistance/Tolerance		25 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		1.85 Volts Maximum
	Current		37 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.37 Volts Minimum
	Current		7.4 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

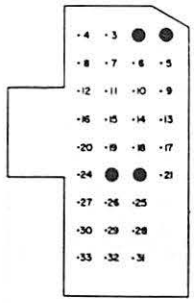
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-22-23

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

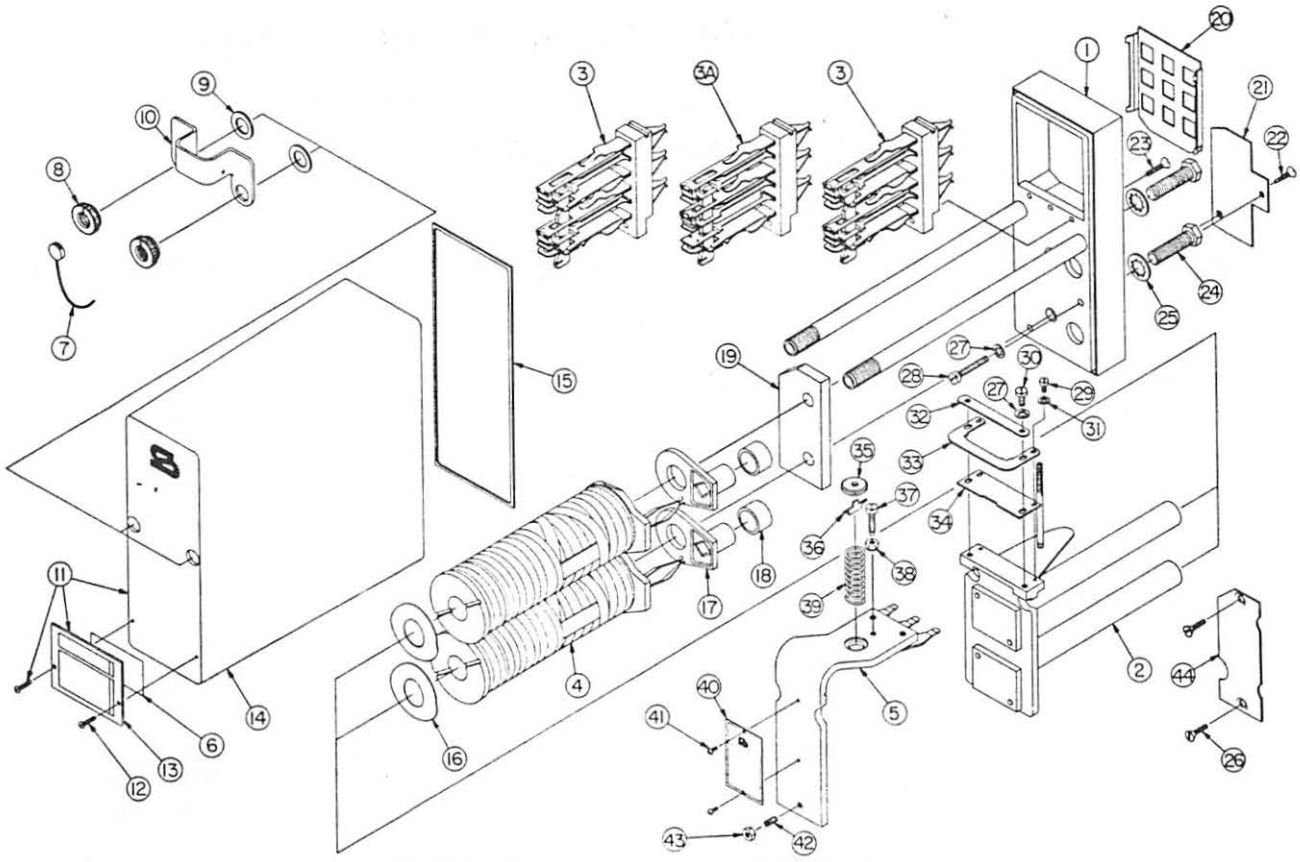
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400014

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400014



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 25 Ohm	2	420051-88X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	2	420053-7	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	2	420051	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	2	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-4
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-59
21	Plate, Code	1	420050-516	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-64

I&M # 410000-51
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

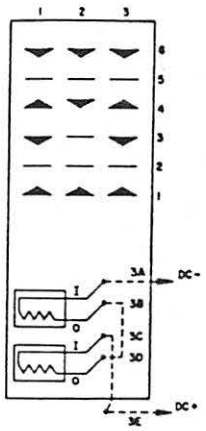
Part Number **400015**

Specification for Type ST Plug-in Relay Neutral Relay, Regular Release 4FB-2F-1B Contacts, 100 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		50 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		1.92 Volts Maximum
	Current		19.2 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		1.05 Volts Minimum
	Current		10.5 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

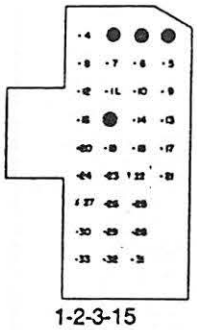
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-3-15

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

Field Requirements

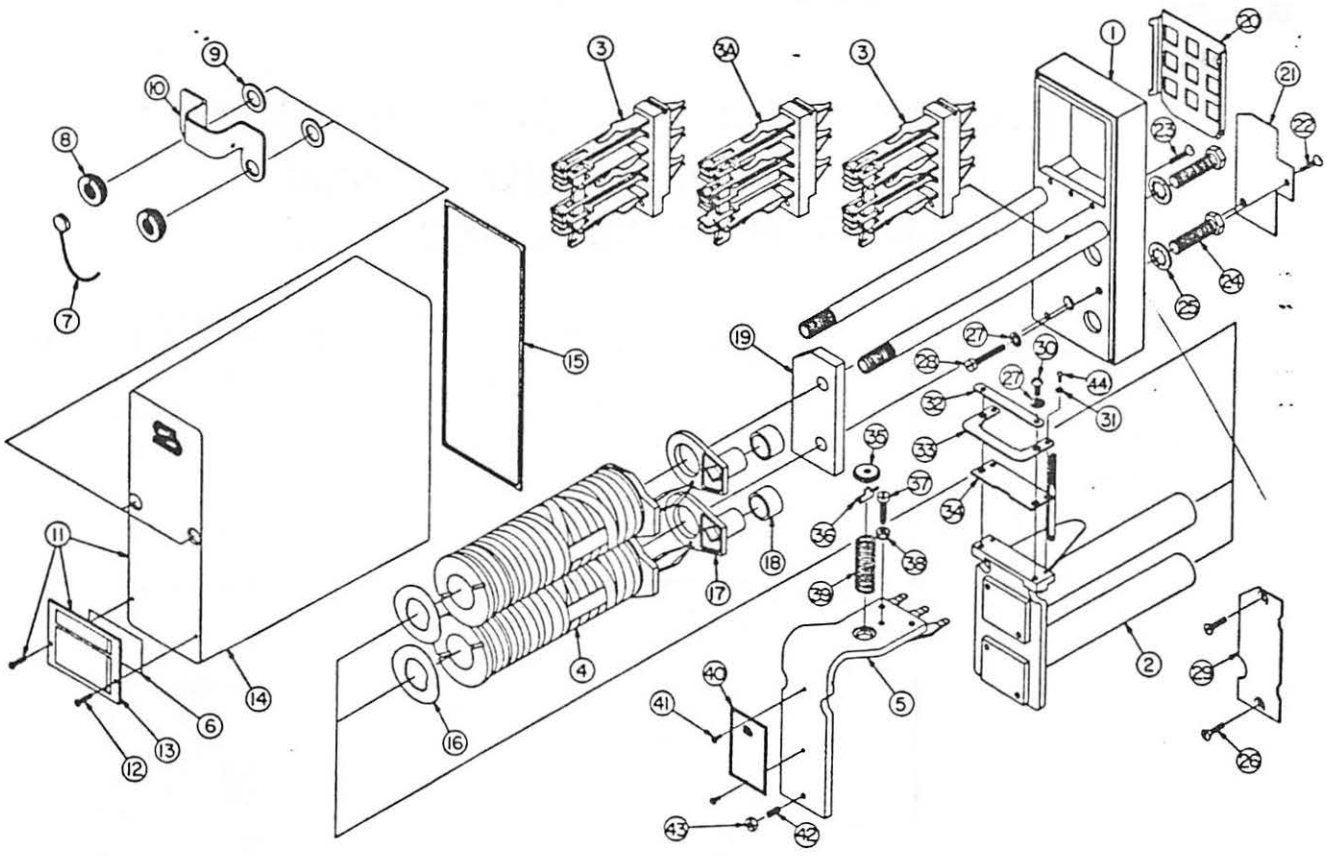
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400015

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400015



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Bolt, Hex Head 5/16"-24 X 1.250"	2	420053-12
2	Frame Assembly, Coil	1	420053-3X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 50 Ohm	2	420051-26X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Plate, Code Pin	1	420050-116
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Pan Head, #8-32 X .375"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-42	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051-8	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-78
20	Seal, Dust	1	420052	41	Phillips Pan Head Screw #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-11				
22	Slotted Screw, Flat Head, #6-20 X .500"	1	420050-528	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Machine Screw, Fillister Head #4-40 X .250"	2	420053-14

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-62
Revised 10/87

Safetran Systems Corporation

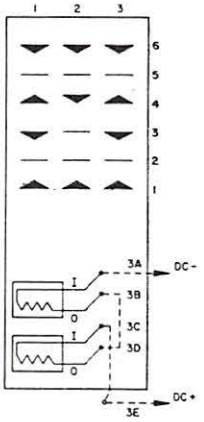
Part Number **400020**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
4FB-2F-1B HD Contacts, 500 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		250 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.05 Volts Maximum
	Current		12.1 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.85 Volts Minimum
	Current		5.7 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B HD
	Rating		15 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

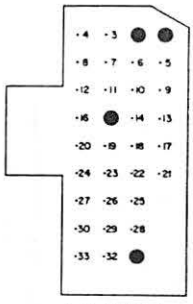
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-15-31

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

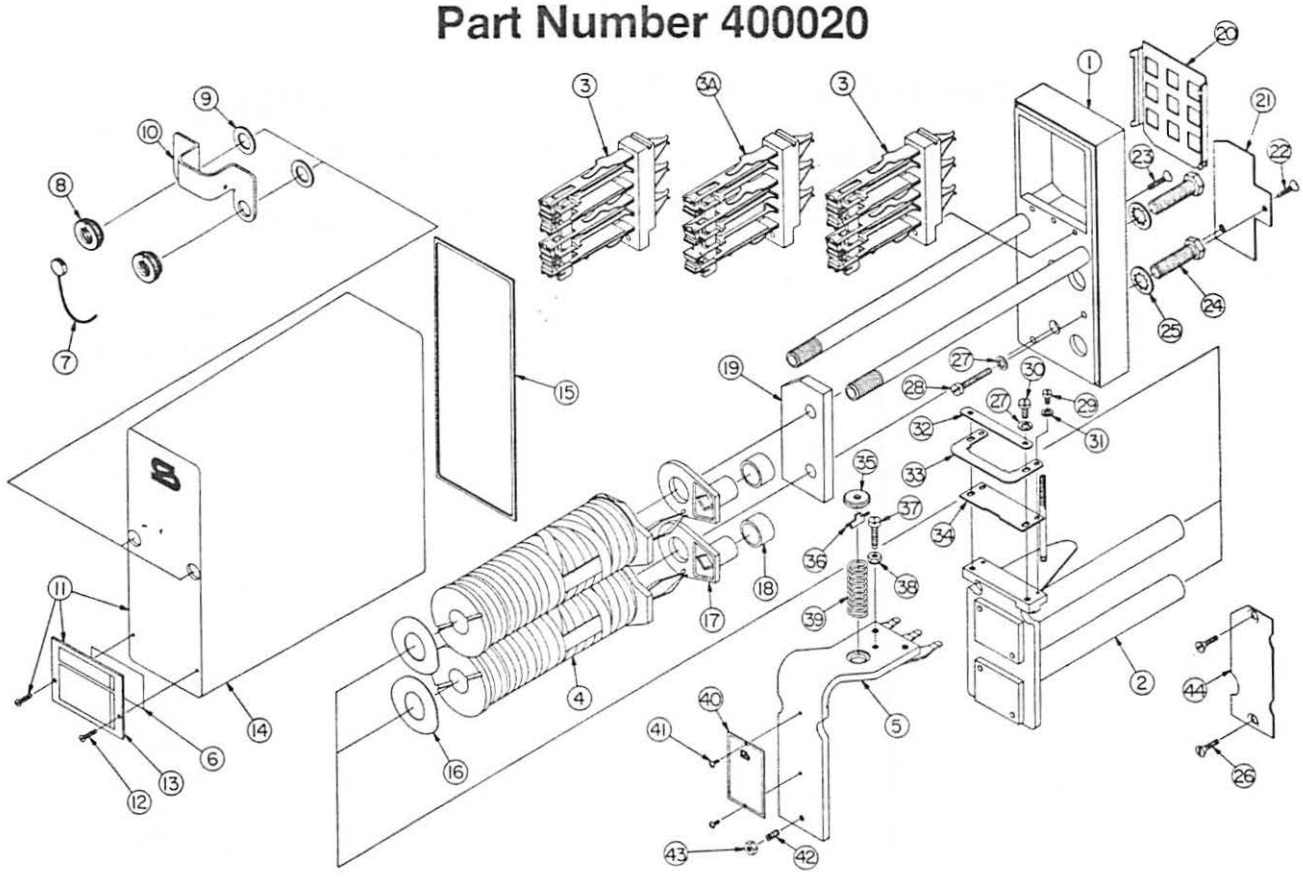
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400020

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400020



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB HD Contact	2	420052-5X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B HD Contact	1	420052-6X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 250 Ohm	2	420051-1X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	2	420053-7	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	2	420051	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	2	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-4
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-26
21	Plate, Code	1	420050-16	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-46

I&M # 410000-17
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

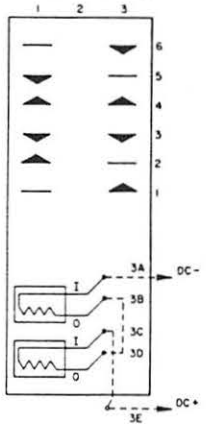
Part Number **400021**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
2B HD, 2FB Contacts, 200 Ohm
For Lamp Control

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		100 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		3.8 Volts Maximum
	Current		19 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		1.3 Volts Minimum
	Current		6.5 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		2B HD, 2FB
	Rating		15 Amps/30 Volts, 4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

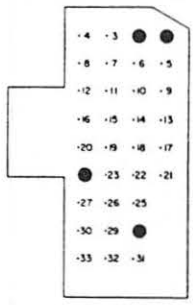
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-24-28

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

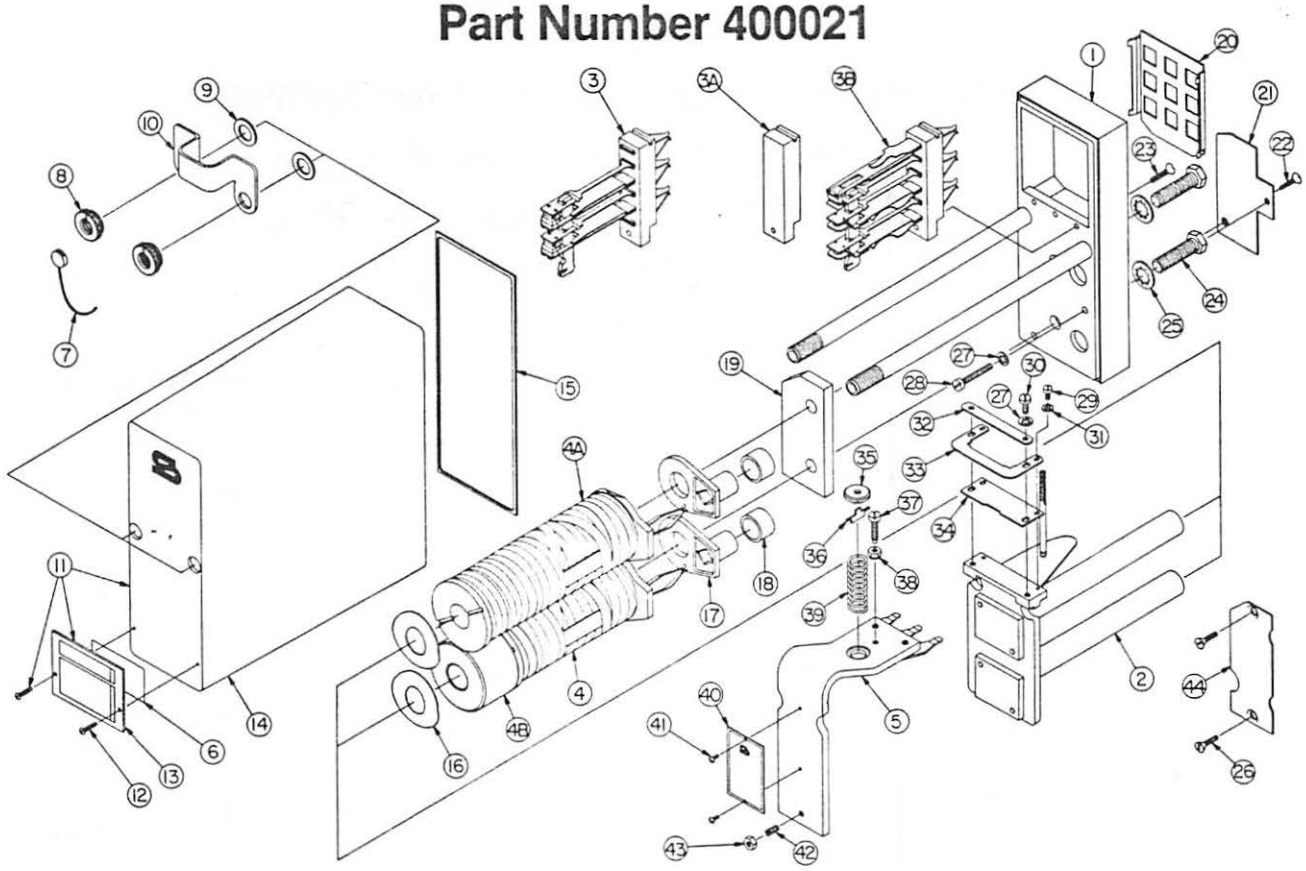
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400021

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400021



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2B HD Contact	1	420052-12X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
3A	Stack, Blank	1	420052-3				
3B	Stack, 2FB Contact	1	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
4	Coil Assembly, 100 Ohm	1	420051-3X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4A	Coil Assembly, 100 Ohm	1	420051-28X				
4B	Slug, Copper	1	420051-9	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	2	420051	39	Spring, Compression	1	420053-4
18	Seal, Rubber	2	420051-1	40	Nameplate, Type ST Relay	1	420053-61
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-506	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-103

I&M # 410000-46
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

Part Number **400022**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
4FB-2F-1B HD Contacts, 900 Ohm

Characteristic			Original Requirements	Contact/Coil Arrangement
Coils	Nominal V or I		10-12 VDC	(Front of Relay)
	Resistance/Tolerance		450 Ohms ± 5% each coil	
Temperature Range			-40C (-40F) to 85C (185F)	
P.U./W.C.	Voltage		8.28 Volts Maximum	
	Current		9.2 milliamps Maximum	
	Speed	Pickup	Regular	
Dropaway	Voltage		3.6 Volts Minimum	
	Current		4 milliamps Minimum	
	Speed	Release	Regular	
Contacts	Arrangement		4FB-2F-1B HD	
	Rating		15 Amps/30 Volts	
	Material	N.O.	Silver/Carbon	
		N.C.	Silver/Silver	
	Dynamic Gap		.020" Minimum	Relay register
	Contact Gap		.050" Minimum	(Rear of Relay)
	Pressure	N.O.	40 Grams Minimum	
		N.C.	21 Grams Minimum	
	Overtravel per Adjustment A		*See note #1 below	
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps	
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps	
Armature Travel			.087" Minimum	
Retainer Gap Reference			.002" to .004"	
Residual Screw (Adjustable)			.010" Minimum	
Stop Pin (Fixed)			.008" Minimum	1-2-3-11

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

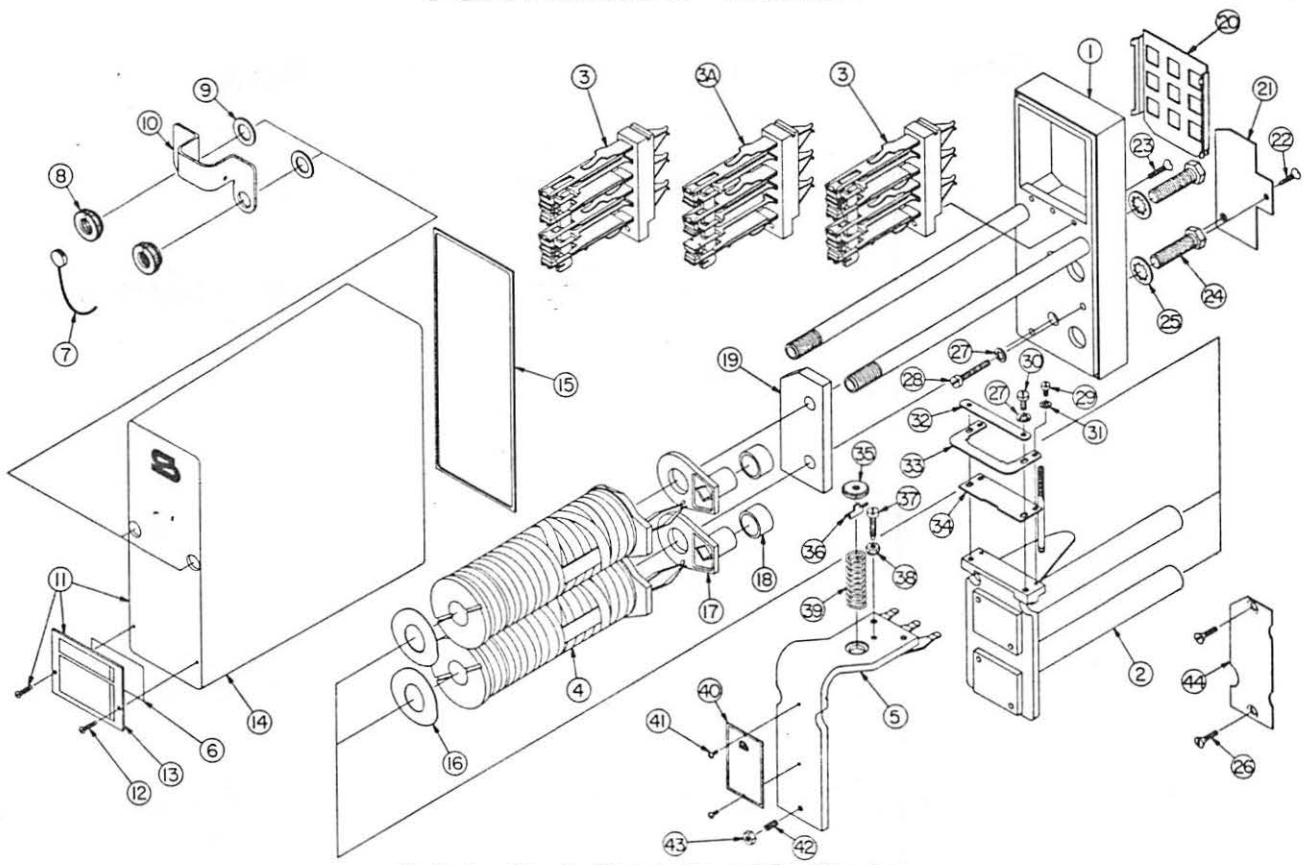
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400022

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400022



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB HD Contact	2	420052-5X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B HD Contact	1	420052-6X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 450 Ohm	2	420051-4X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	2	420053-42	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	2	420051-8	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	2	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-43
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-62
21	Plate, Code	1	420050-507	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-43

I&M # 410000-47
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems

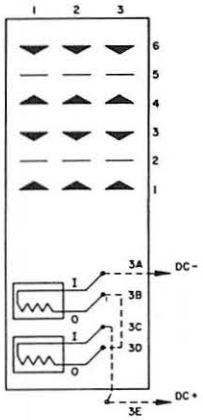
Part Number **400023**

Specification for Type ST Plug-in Relay
Neutral Relay, Regular Release
6FB HD Contacts, 500 Ohm

	Characteristic		Original Requirements
Coils	Nominal V or I		10-12 VDC
Coils	Resistance/Tolerance		250 Ohms ±5% Each Coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		8.25 Volts Maximum
P.U./W.C.	Current		16.5 milliamps Maximum
P.U./W.C.	Speed	Pickup	Regular
Dropaway	Voltage		1.7 Volts Minimum
Dropaway	Current		3.4 milliamps Minimum
Dropaway	Speed	Release	Regular
Contacts	Arrangement		6FB HD
Contacts	Rating		15 Amps/30 Volts
Contacts	Material	N.O.	SCdO/SCdO
Contacts	Material	N.C.	SCdO/SCdO
Contacts	Dynamic Gap		.020" Minimum
Contacts	Contact Gap		.050" Minimum
Contacts	Pressure	N.O.	40 Grams Minimum
Contacts	Pressure	N.C.	21 Grams Minimum
Contacts	Overtravel per Adjustment 1		*See Note #1 Below
Contacts	Resistance	N.O.	30 milliohms Maximum @10 VDC, 1.0 Amps
Contacts	Resistance	N.C.	30 milliohms Maximum @10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

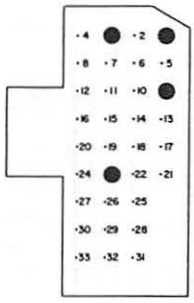
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-3-9-23

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

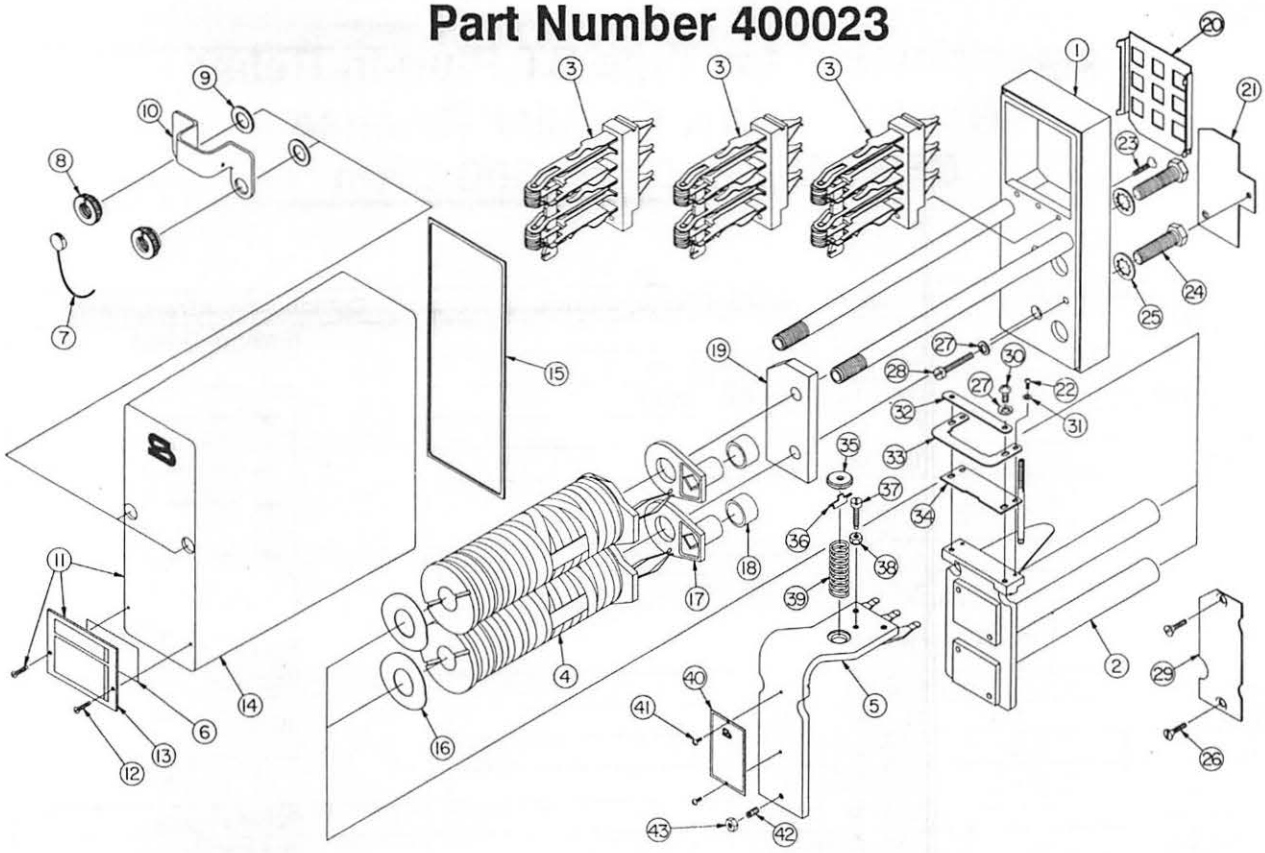
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400023

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400023



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number	Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly, Plug-In Relay	1	420050-X	25	Washer, Spring, Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Machine Screw, Flat Head, #6-32 x .5"	2	420050-36
3	Stack, 2FB HD Contact	3	420052-4X	27	Washer, Spring Lock, I, #8	3	420050-33
4	Coil Assembly, 250 Ohm	2	420051-1X	28	Machine Screw, Pan Head, #8-32 x .937"	1	420050-32
5	Armature	1	420053-1X	29	Plate, Code Pin	1	420050-110
6	Label, Paper Identification	1	420050-3	30	Machine Screw, Pan Head, #8-32 X .375"	2	420053-16
7	Seal, Lead	1	420050-8	31	Washer, Spring Lock, I, #4	2	420053-15
8	Nut, Knurl Locking	2	420050-5	32	Plate, Retainer	1	420053-3
9	Washer, Flat Rubber	2	420050-7	33	Retainer, Armature	1	420053-2
10	Bracket, Cover	1	420050-4	34	Plate, Hinge	1	420053-1
11	Cover Assembly	1	420050-2X	35	Nut, Spring Post	1	420053-6
12	Tap Screw, Round Head, #4 x .375"	2	420050-35	36	Key, Spring Retainer	1	420053-5
13	Cover, Nameplate	1	420050-2	37	Screw, Tailstop	1	420053-9
14	Molded Cover, Clear	1	420050	38	Nut, Tailstop	1	420053-8
15	Gasket, Cover	1	420050-1	39	Spring, Compression	1	420053-4
16	Washer, Spring	2	420053-7	40	Nameplate, Type ST Relay	1	420053-72
17	Insulator, Terminal Retainer	2	420051	41	Phillips Screw, Pan Head, #4-40 X .187"	2	420053-18
18	Seal, Rubber	2	420051-1	42	Screw, Residual	1	420053-11
19	Plate, Base	1	420053	43	Nut, Residual	1	420053-10
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-521				
22	Machine Screw, Fillister Head, #4-40 x .250"	2	420053-14				
23	Machine Screw, Flat Head, #6-32 x .531"	3	420050-36				
24	Machine Screw, Hex Head, 5/16" -24 x 1.125"	2	420053-12				

Safetran Systems Corporation
4650 Main Street N.E.
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612/572-0466

I&M # 410000-78
Revised 4/94

Safetran Systems Corporation

Part Number **400025**

Specification for Type ST Plug-in Relay
Neutral Relay, Switch Control
4FB HD Contacts, 500 Ohm

Characteristic			Original Requirements	Contact/Coil Arrangement
Coils	Nominal V or I		10-12 VDC	(Front of Relay)
	Resistance/Tolerance		250 Ohms ± 5% each coil	
Temperature Range			-40C (-40F) to 85C (185F)	
P.U./W.C.	Voltage		6.5 Volts Maximum	
	Current		13 milliamps Maximum	
	Speed	Pickup	Regular	
Dropaway	Voltage		2.5 Volts Maximum	
	Current		5.0 milliamps Minimum	
	Speed	Release	Regular	
Contacts	Arrangement		4FB HD	
	Rating		15 Amps/30 Volts	
	Material	N.O.	Scdo - Scdo	
		N.C.	Scdo - Scdo	
	Dynamic Gap		.060" Minimum	Relay register
	Contact Gap		.090" Minimum	(Rear of Relay)
	Pressure	N.O.	75 Grams Minimum	
		N.C.	21 Grams Minimum	
	Overtravel per Adjustment G		*See note #1 below	
	Resistance	N.O.	30 milliohms Maximum @ 10 VDC, 1.0 Amps	
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps	
Armature Travel			.120" Minimum	
Retainer Gap Reference			.002" to .004"	
Residual Screw (Adjustable)			.010" Minimum	
Stop Pin (Fixed)			.008" Minimum	1-3-7-11

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .099" and break with .092" between armature residual screw and core.

Field Requirements

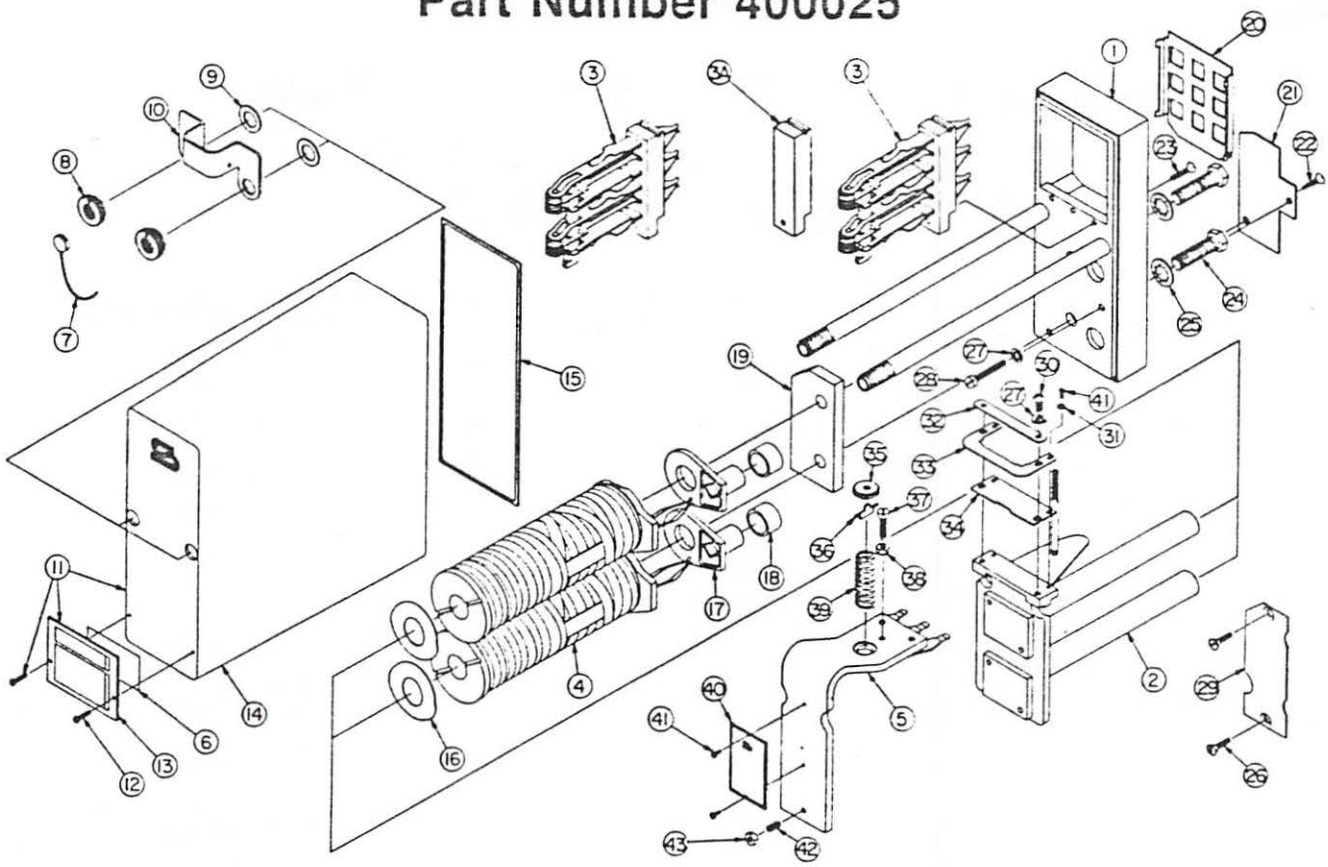
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400025

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400025



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB HD Contact	2	420052-4X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank	1	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 250 Ohm	2	420051-1X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Plate, Code Pin	1	420050-113
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Pan Head, #8-32 X .375"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-7	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-74
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	4	420053-18
21	Plate, Code	1	420050-524				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

Safetran Systems Corporation
4650 Main Street, N.E.
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612/572-0466

I&M #410000-60
Revised 12/86

Safetran Systems Corporation

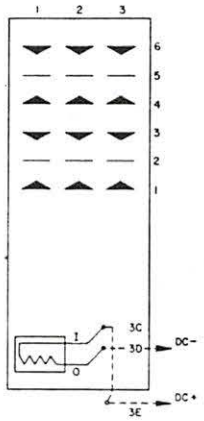
Part Number **400100**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Pickup
6FB Contacts, 220 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		220 Ohms ± 5% (Single Coil)
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		9 Volts Maximum
	Current		41 milliamps Maximum
	Speed	Pickup	1.35 Seconds ± 10% Delay @ 11 Volts
Dropaway	Voltage		4.4 Volts Minimum
	Current		20 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

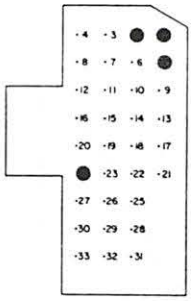
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-5-24

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

Field Requirements

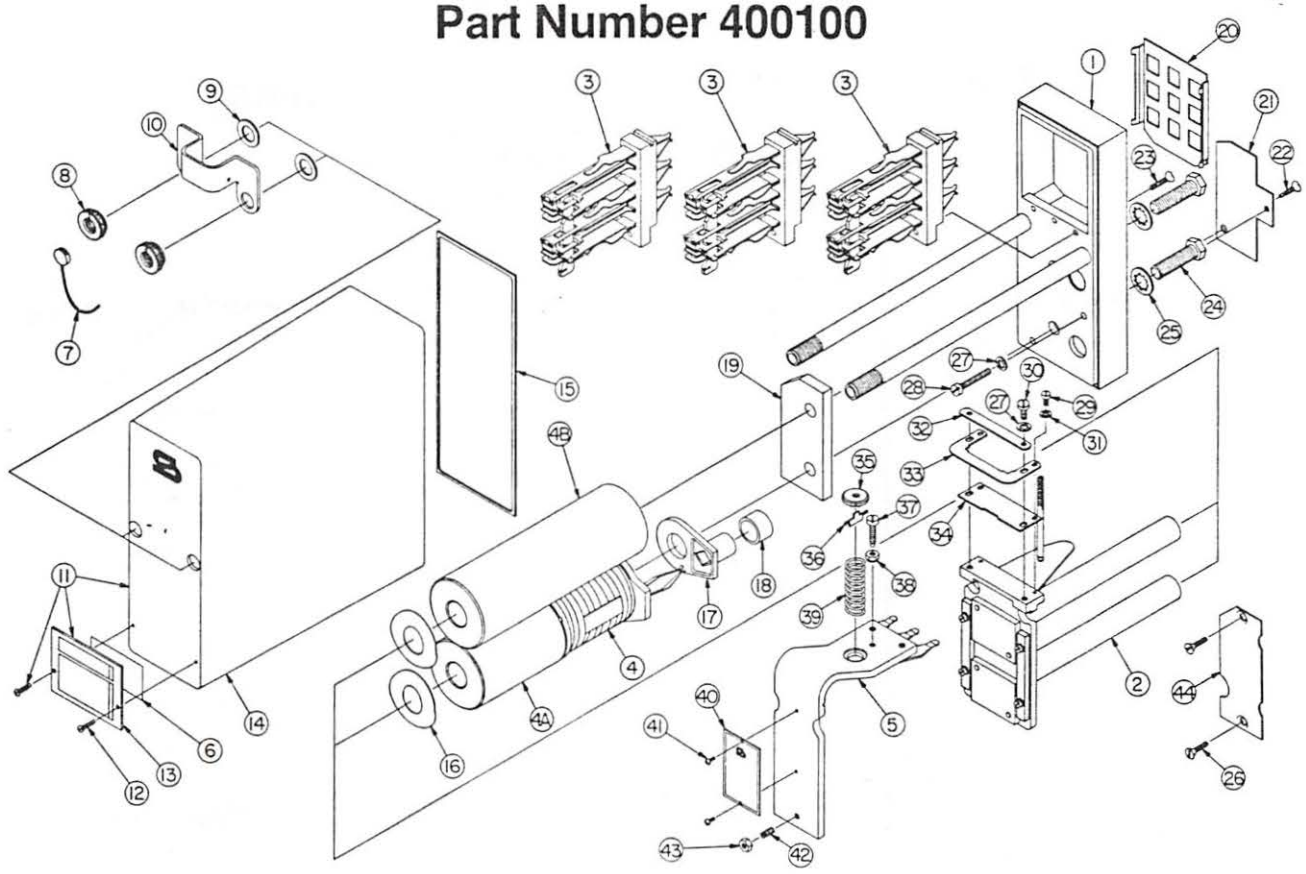
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400100

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400100



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-1X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-2X				
3	Stack, 2FB Contact	3	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
4	Coil Assembly, 220 Ohm	1	420051-7X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4A	Slug, Copper	1	420051-2				
4B	Slug, Copper	1	420051-3	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-7	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-27
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-17				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-47

I&M # 410000-18
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

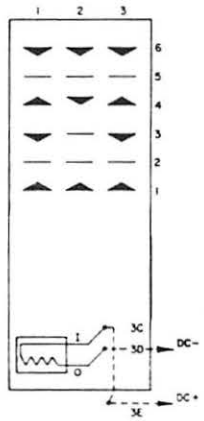
Part Number **400101**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Pickup
4FB-2F-1B Contacts, 300 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		300 Ohms ± 5% (Single Coil)
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		10.2 Volts Maximum
	Current		34 milliamps Maximum
	Speed	Pickup	1.4 Seconds ± 10% Delay @ 13.2 Volts
Dropaway	Voltage		4.8 Volts Minimum
	Current		16 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

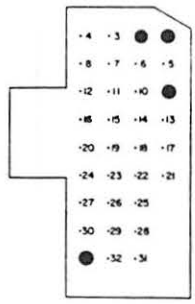
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-11-33

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

Field Requirements

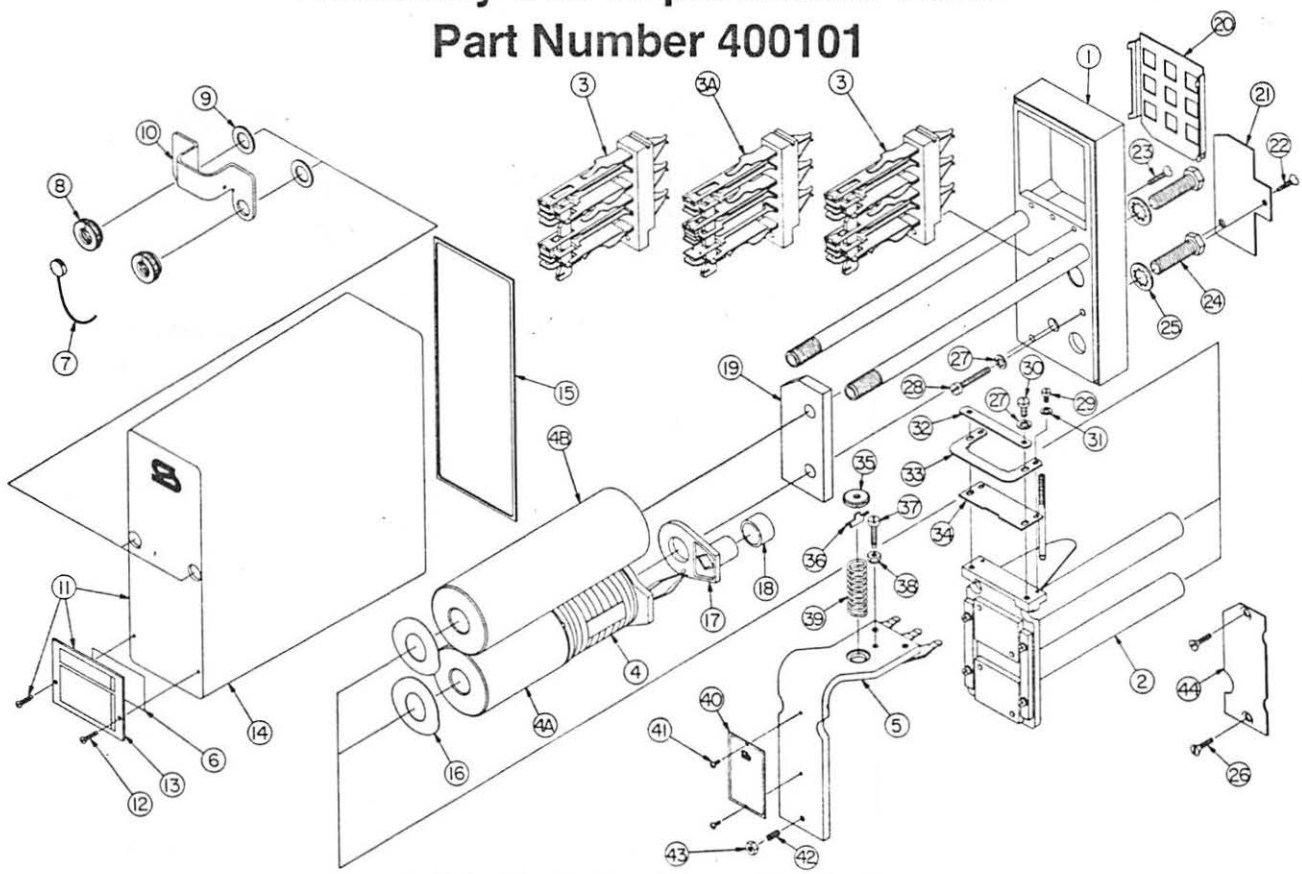
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400101

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400101



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-1X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-2X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 300 Ohm	1	420051-25X				
4A	Slug, Copper	1	420051-2	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	1	420051-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	1	420051	39	Spring, Compression	1	420053-4
18	Seal, Rubber	1	420051-1	40	Nameplate, Type ST Relay	1	420053-27
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-100	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-500
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-38
Revised 6/83

Safetran Systems Corporation

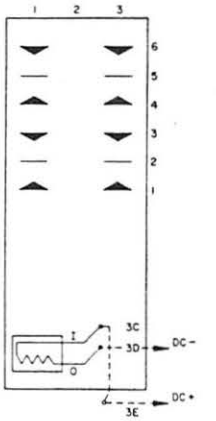
Part Number **400200**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Release
4FB Contacts, 194 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		194 Ohms ± 5% (Single Coil)
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6 Volts Maximum
	Current		31 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.97 Volts Minimum
	Current		5 milliamps Minimum
	Speed	Release	3.0 Seconds ± 10% Delay @ 12 Volts
Contacts	Arrangement		4FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.004" Minimum
Stop Pin (Fixed)			.003" Minimum

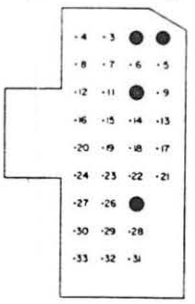
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-10-25

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

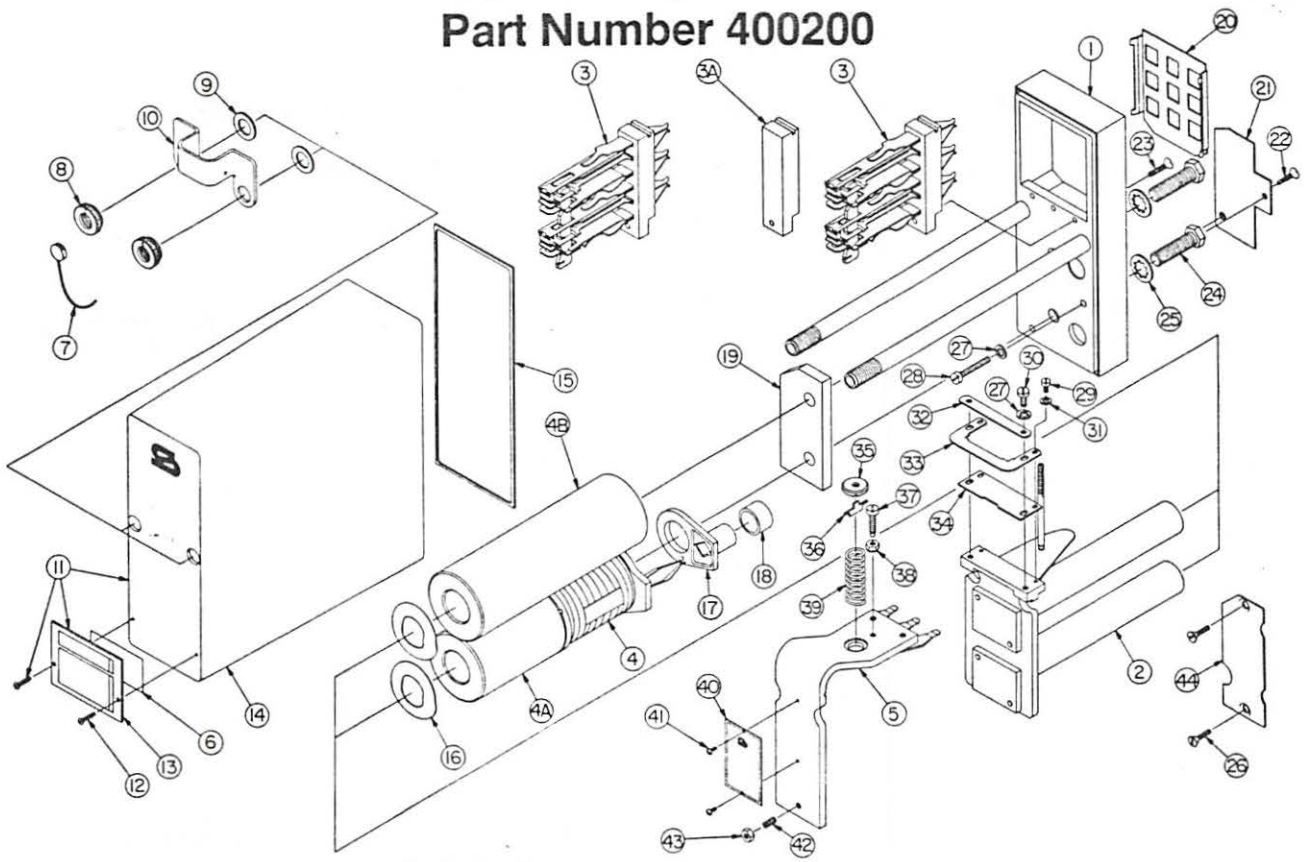
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400200

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400200



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-1X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-7X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	1	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 194 Ohm	1	420051-8X				
4A	Slug, Copper	1	420051-6	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	1	420051-7	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-42	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	1	420051-8	39	Spring, Compression	1	420053-4
18	Seal, Rubber	1	420051-1	40	Nameplate, Type ST Relay	1	420053-28
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-18	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-48
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

I&M # 410000-19
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

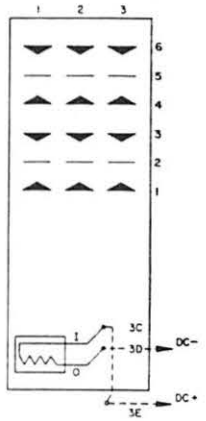
Part Number **400210**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Release
6FB Contacts, 194 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		194 Ohms ± 5% (Single Coil)
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.8 Volts Maximum
	Current		35 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		1.78 Volts Minimum
	Current		9.2 milliamps Minimum
	Speed	Release	1.0 Second ± 10% Delay @ 10 Volts
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.005" Minimum
Stop Pin (Fixed)			.003" Minimum

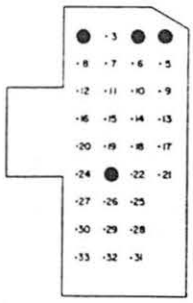
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-4-23

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

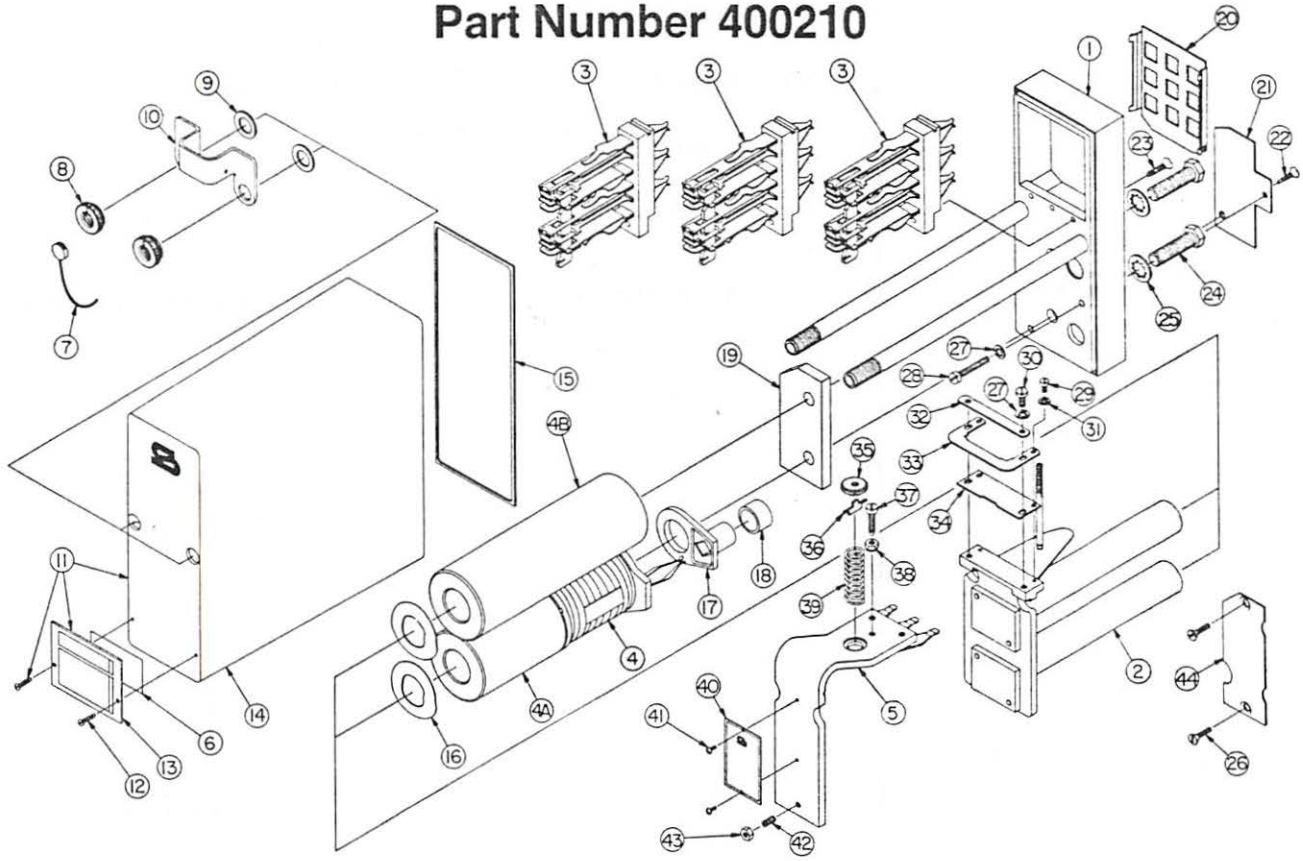
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400210

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400210



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-1X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-7X				
3	Stack, 2FB Contact	3	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
4	Coil Assembly, 194 Ohm	1	420051-8X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4A	Slug, Aluminum	1	420051-4				
4B	Slug, Aluminum	1	420051-5	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-42	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	1	420051-8	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	1	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-29
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-19				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-49

I&M # 410000-20
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

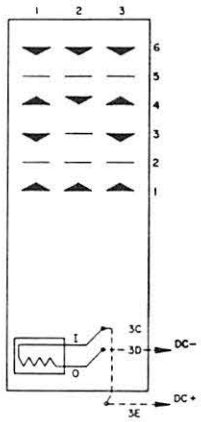
Part Number **400211**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Release
4FB-2F-1B Contacts, 194 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		194 Ohms ± 5% (Single Coil)
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.8 Volts Maximum
	Current		35 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		1.78 Volts Minimum
	Current		9.2 milliamps Minimum
	Speed	Release	1.0 Second ± 10% Delay @ 10 Volts
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.005" Minimum
Stop Pin (Fixed)			.003" Minimum

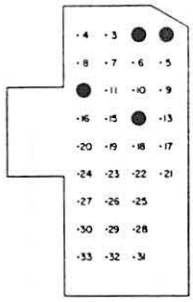
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-12-14

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

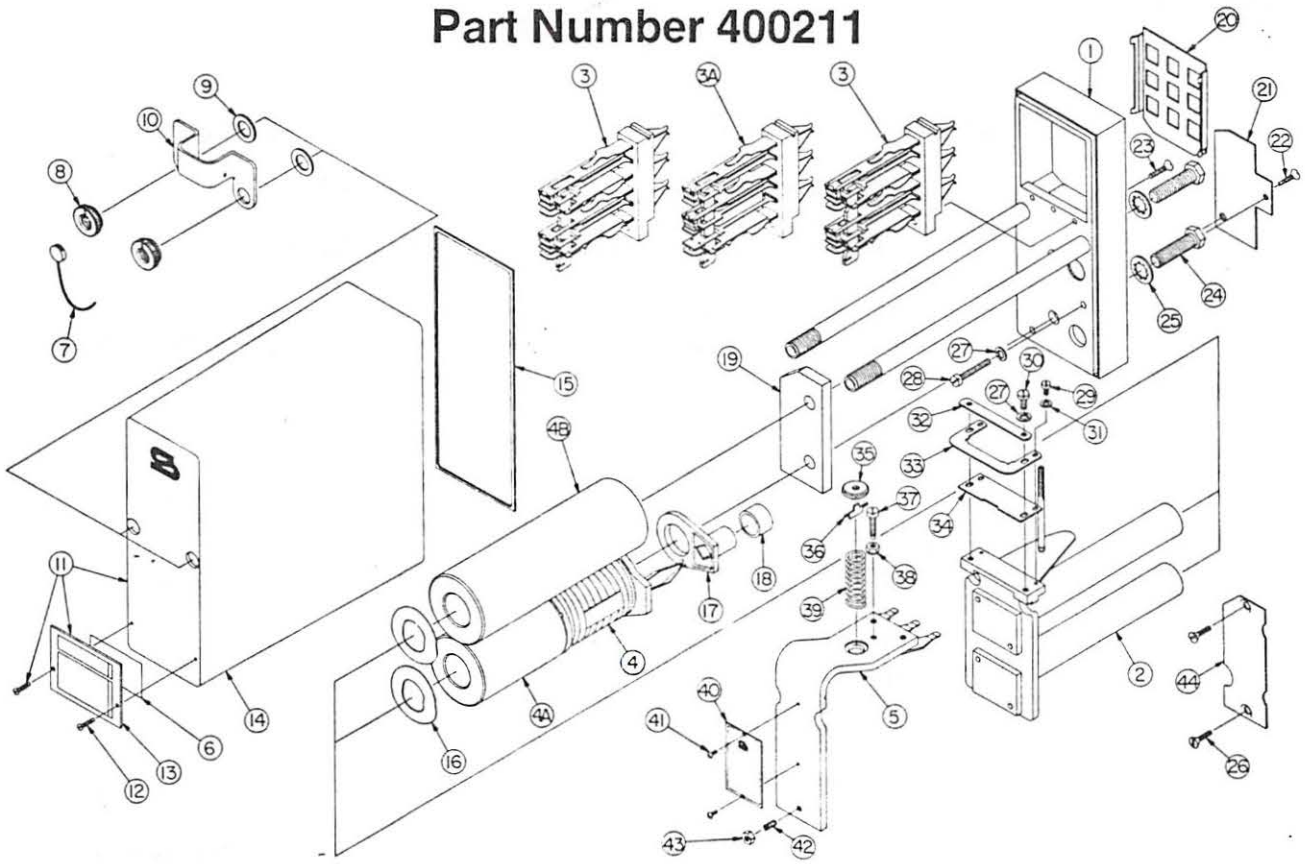
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400211

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400211



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-1X	24	**Machine Screw, Hex Head, 5/16"-24 X 1.125"**	2	420053-12
2	Frame Assembly, Coil	1	420053-7X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 194 Ohm	2	420051-8X				
4A	Slug, Aluminum	1	420051-4	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Aluminum	1	420051-5	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-42	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	1	420051-8	39	Spring, Compression	1	420053-4
18	Seal, Rubber	1	420051-1	40	Nameplate, Type ST Relay	1	420053-53
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-101	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-501
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

I&M # 410000-39
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

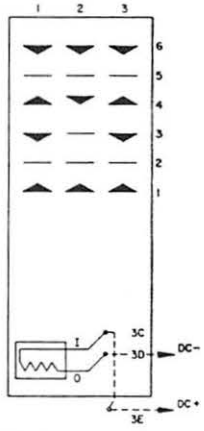
Part Number **400212**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Release
4FB-2F-1B Contacts, 194 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		194 Ohms ± 5% (Single Coil)
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.50 Volts Maximum
	Current		33.5 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		1.05 Volts Minimum
	Current		5.4 milliamps Minimum
	Speed	Release	2.8 Seconds ± 10% Delay @ 10 Volts
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.004" Minimum
Stop Pin (Fixed)			.003" Minimum

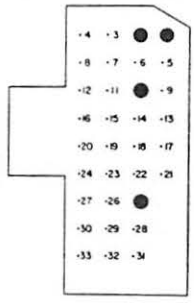
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-10-25

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

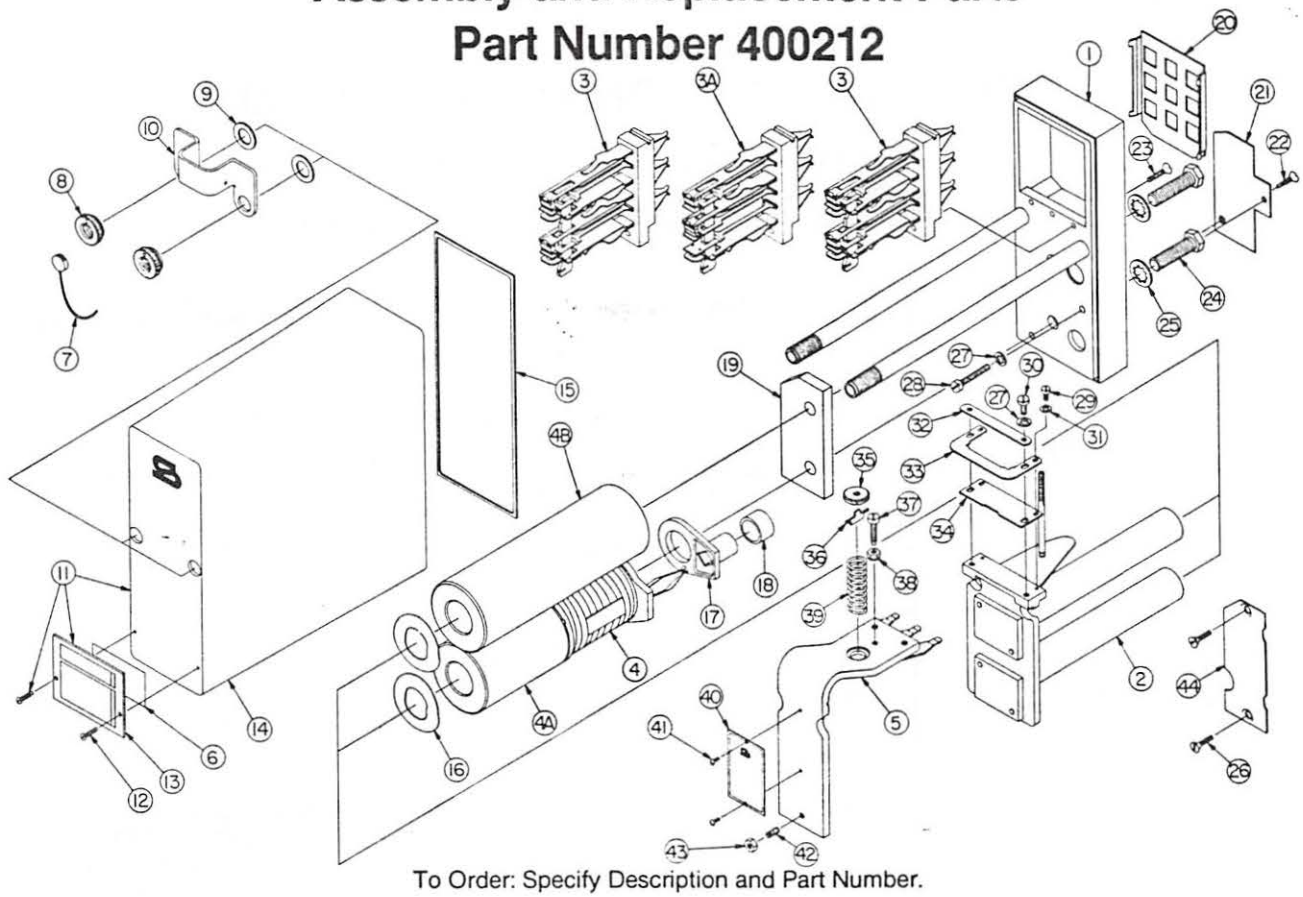
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400212

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400212



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-1X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-7X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 194 Ohm	1	420051-8X				
4A	Slug, Copper	1	420051-6	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	1	420051-7	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-42	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	1	420051-8	39	Spring, Compression	1	420053-4
18	Seal, Rubber	1	420051-1	40	Nameplate, Type ST Relay	1	420053-63
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-508	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-48
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

I&M # 410000-48
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems

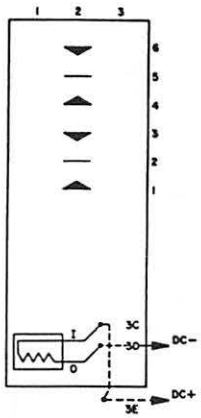
Part Number **400213**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Release
2FB Contacts, 460 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		460 Ohm ±5% (Single Coil)
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.44 Volts Maximum
	Current		14 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.644 Volts Minimum
	Current		1.4 milliamps Minimum
	Speed	Release	3.0 Seconds + 10% Delay @ 9 volts
Contacts	Arrangement		2FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See Note #1 Below
	Resistance	N.O.	90 milliohms Maximum @10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.004" Minimum
Stop Pin (Fixed)			.003" Minimum

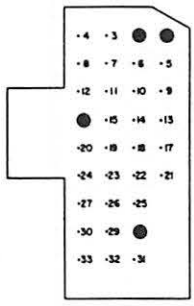
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-16-28

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to raise the armature stop screw from its stop.

Field Requirements

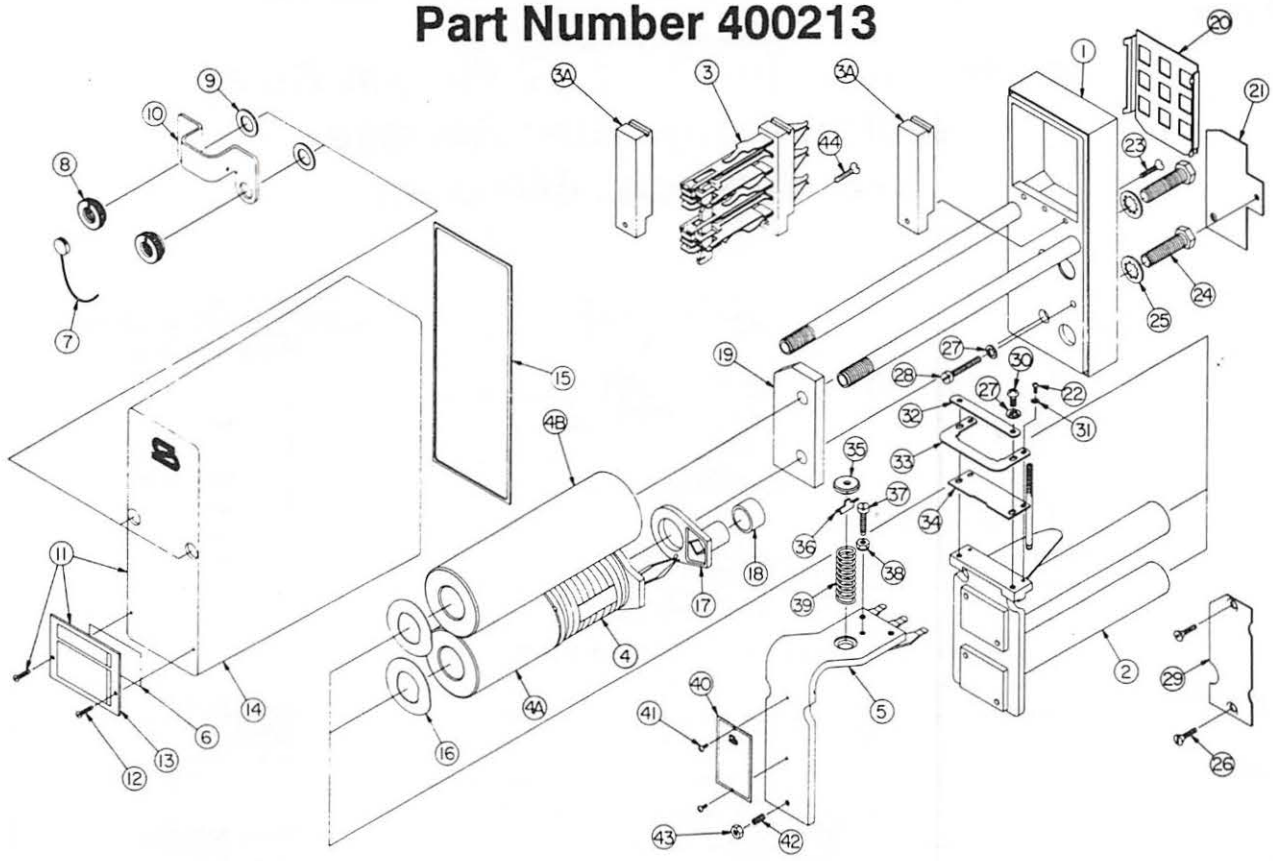
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400213

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400213



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-1X	24	Machine Screw, Hex Head, 5/16" -24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-7X				
3	Stack, 2FB Contact	1	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	2	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 460 Ohm	1	420051-32X				
4A	Slug, Copper	1	420051-6	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	1	420051-7	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Plate, Code Pin	1	420050-105
7	Seal, Lead	1	420050-8	30	Machine Screw, Pan Head, #8-32 X .375"	2	420053-16
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	31	Washer, Spring Lock, I, #4	2	420053-15
10	Bracket, Cover	1	420050-4	32	Plate, Retainer	1	420053-3
11	Cover Assembly	1	420050-2X	33	Retainer, Armature	1	420053-2
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	34	Plate, Hinge	1	420053-1
				35	Nut, Spring Post	1	420053-6
13	Cover, Nameplate	1	420050-2	36	Key, Spring Retainer	1	420053-5
14	Molded Cover, Clear	1	420050	37	Screw, Tailstop	1	420053-9
15	Gasket, Cover	1	420050-1	38	Nut, Tailstop	1	420053-8
16	Washer, Spring	2	420053-42	39	Spring, Compression	1	420053-4
17	Insulator, Terminal Retainer	1	420051-8	40	Nameplate, Type ST Relay	1	420053-67
18	Seal, Rubber	1	420051-1	41	Phillips Screw, Pan Head, #4-40 X .187"	2	420053-18
19	Plate, Base	1	420053				
20	Seal, Dust	1	420052	42	Screw, Residual	1	420053-11
21	Plate, Code	1	420050-517	43	Nut, Residual	1	420053-10
22	Machine Screw, Fillister Head, #4-40 X .250"	2	420053-14	44	Machine Screw, Flat Head, #6-32 X .531"	1	420050-36
23	Machine Screw, Flat Head, #6-32 X .375"	2	420052-2				

Safetran Systems Corporation
4650 Main Street. N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-52
Revised 4/94

Safetran Systems Corporation

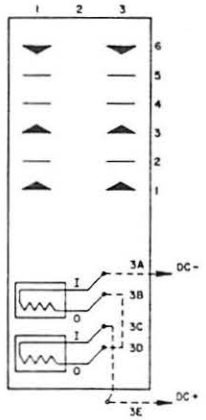
Part Number **400220**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Release
2F-4B Contacts, 80 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		Special - See Ratings
	Resistance/Tolerance		40 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		1.9 Volts Maximum
	Current		24 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.5 Volts Minimum
	Current		6.5 milliamps Minimum
	Speed	Release	0.1 Second ± 10% Delay @ 2 Volts
Contacts	Arrangement		2F-4B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.005" Minimum
Stop Pin (Fixed)			.003" Minimum

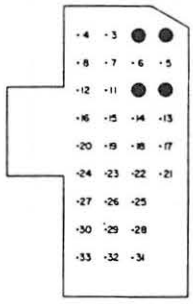
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-9-10

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

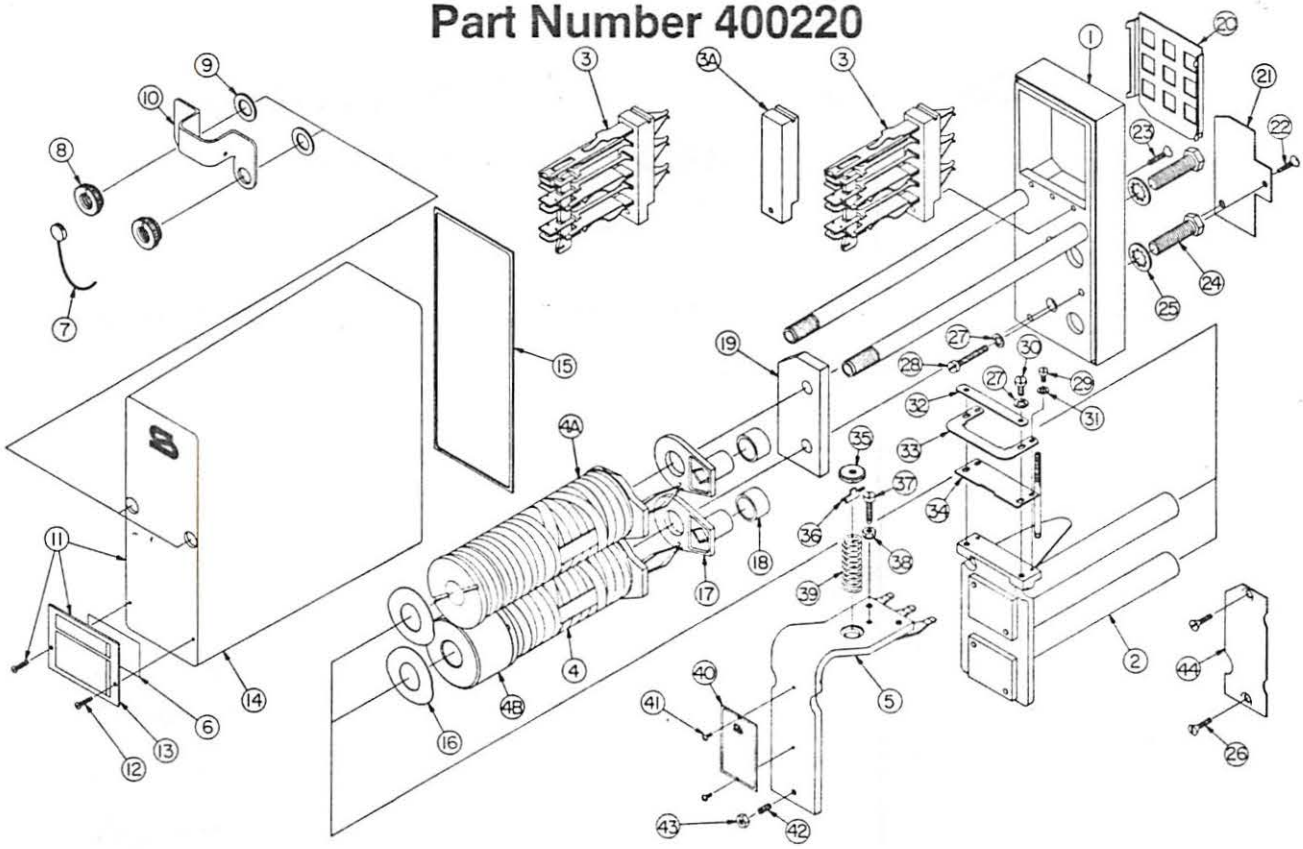
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400220

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400220



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-6X				
3	Stack, 1F-2B Contact	2	420052-8X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	1	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 40 Ohm	1	420051-21X				
4A	Coil Assembly, 40 Ohm	1	420051-22X	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	1	420051-9	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	2	420051	39	Spring, Compression	1	420053-4
18	Seal, Rubber	2	420051-1	40	Nameplate, Type ST Relay	1	420053-30
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-20	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-50
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-21
Revised 6/83

Safetran Systems Corporation

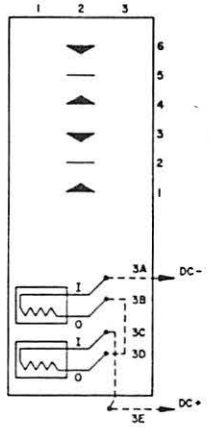
Part Number **400221**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Release
2FB Contacts, 24 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		Special
	Resistance/Tolerance		12 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		0.55 Volts Maximum
	Current		23 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		0.14 Volts Minimum
	Current		6 milliamps Minimum
	Speed	Release	0.4 Second ± 10% Delay @ 0.7 Volts
Contacts	Arrangement		2FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.005" Minimum
Stop Pin (Fixed)			.003" Minimum

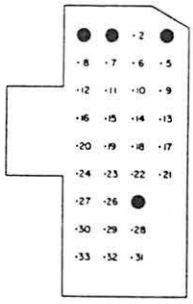
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-3-4-25

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

Field Requirements

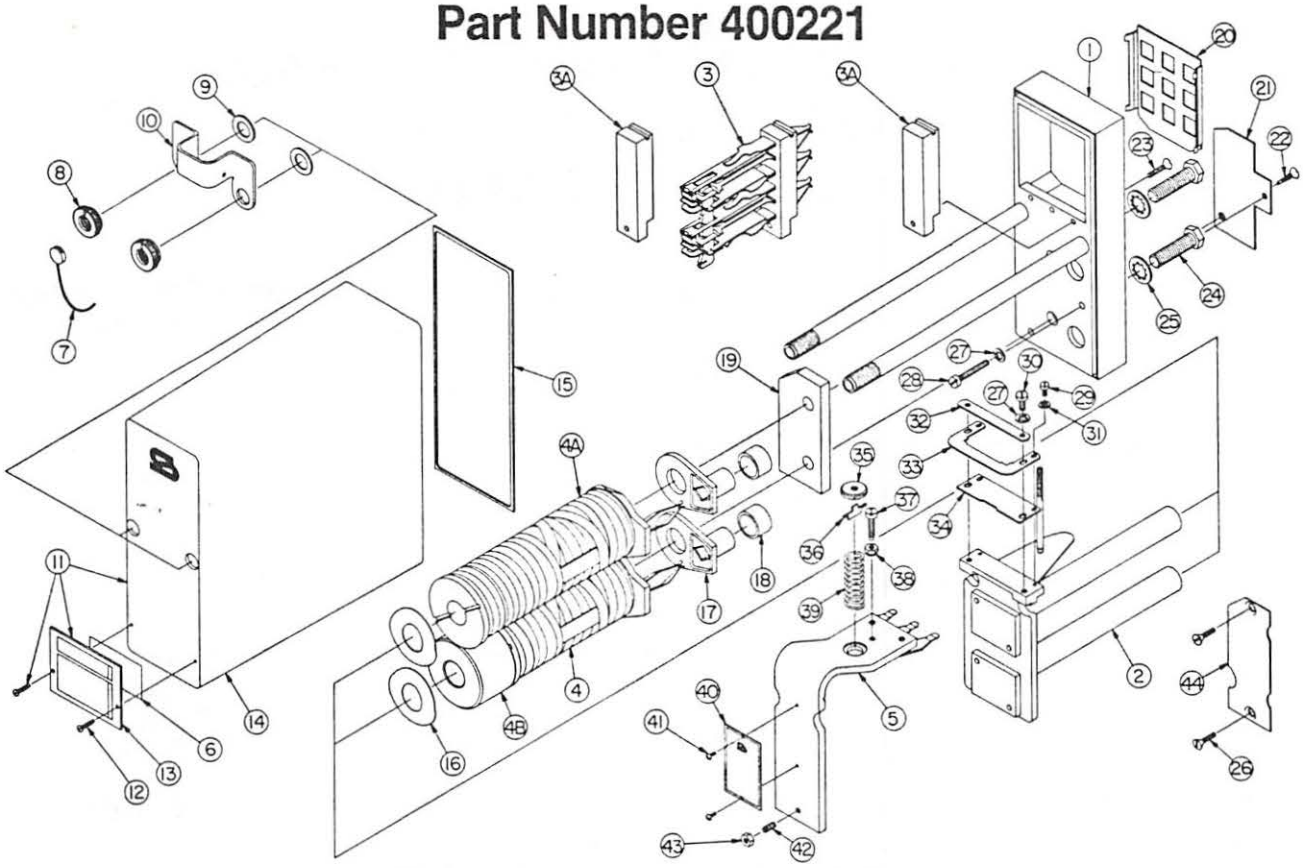
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400221

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400221



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-9X				
3	Stack, 2FB Contact	1	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	2	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 12 Ohm	1	420051-29X				
4A	Coil Assembly, 12 Ohm	1	420051-30X	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	1	420051-9	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	2	420051	39	Spring, Compression	1	420053-4
18	Seal, Rubber	2	420051-1	40	Nameplate, Type ST Relay	1	420053-64
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-509	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-104
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-49
Revised 8/85

Safetran Systems Corporation

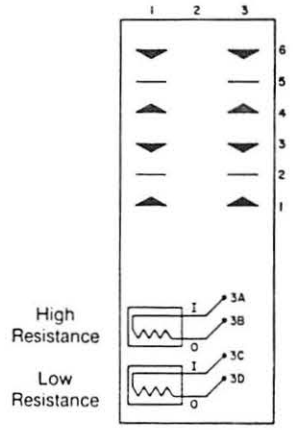
Part Number **400300**

Specification for Type ST Plug-in Relay
Neutral Relay, Light Out
4FB Contacts, 450/.12 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC/VAC w/Rectifier
	Nominal Lamp Load		18-25 Watts
	Resistance/Tolerance		450/.12 Ohms ± 5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	High Resistance		11.5 mA Maximum w/o Rectifier
	Low Resistance		883 mA Maximum w/o Rectifier
	Speed	Pickup	Regular
Dropaway	High Resistance		6.1 mA Minimum w/o Rectifier
	Low Resistance		475 mA Minimum w/o Rectifier
	Speed	Release	Regular
Contacts	Arrangement		4FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

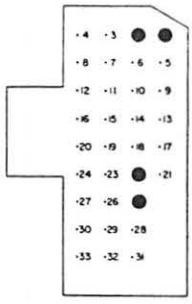
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-22-25

An external Rectifier Stack Assembly, Part Number 400300-1X, must be used with relay for AC or DC lighting operation.
Part Number 400300-X includes Light Out Relay, Part Number 400300, and Rectifier Assembly, Part Number 400300-1X.

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

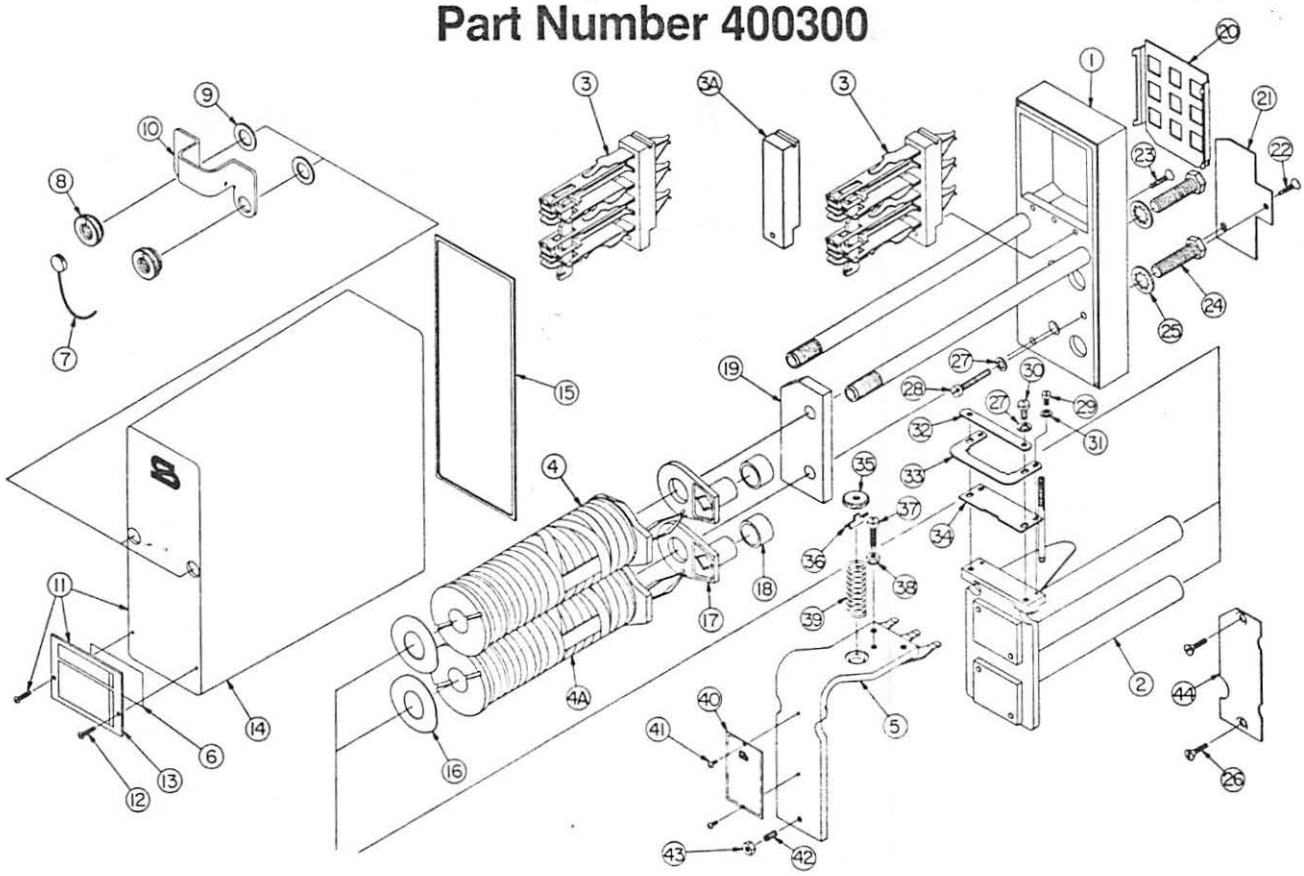
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400300

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400300



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	1	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 450 Ohm	1	420051-4X				
4A	Coil Assembly, .12 Ohm	1	420051-6X	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-7	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-31
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-21				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-51

I&M # 410000-22
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

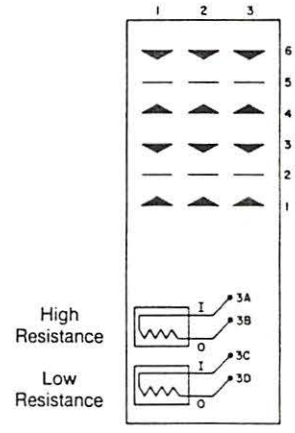
Part Number **400301**

Specification for Type ST Plug-in Relay
Neutral Relay, Light Out
6FB Contacts, 450/.2 Ohm

Characteristic			Original Requirements
Coils	Nominal V		10-12 VDC/VAC w/Rectifier
	Nominal Lamp Load		10-18 Watts
	Resistance/Tolerance		450/.2 Ohms ± 5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	High Resistance		16 mA Maximum w/o Rectifier
	Low Resistance		840 mA Maximum w/o Rectifier
	Speed	Pickup	Regular
Dropaway	High Resistance		8 mA Minimum w/o Rectifier
	Low Resistance		430 mA Minimum w/o Rectifier
	Speed	Release	Regular
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

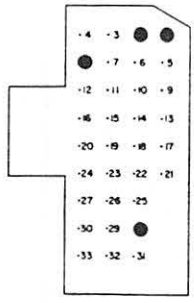
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-8-28

An external Rectifier Stack Assembly, Part Number 400300-1X, must be used with relay for AC or DC lighting operation.

Part Number 400301-X includes Light Out Relay, Part Number 400301, and Rectifier Assembly, Part Number 400300-1X.

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

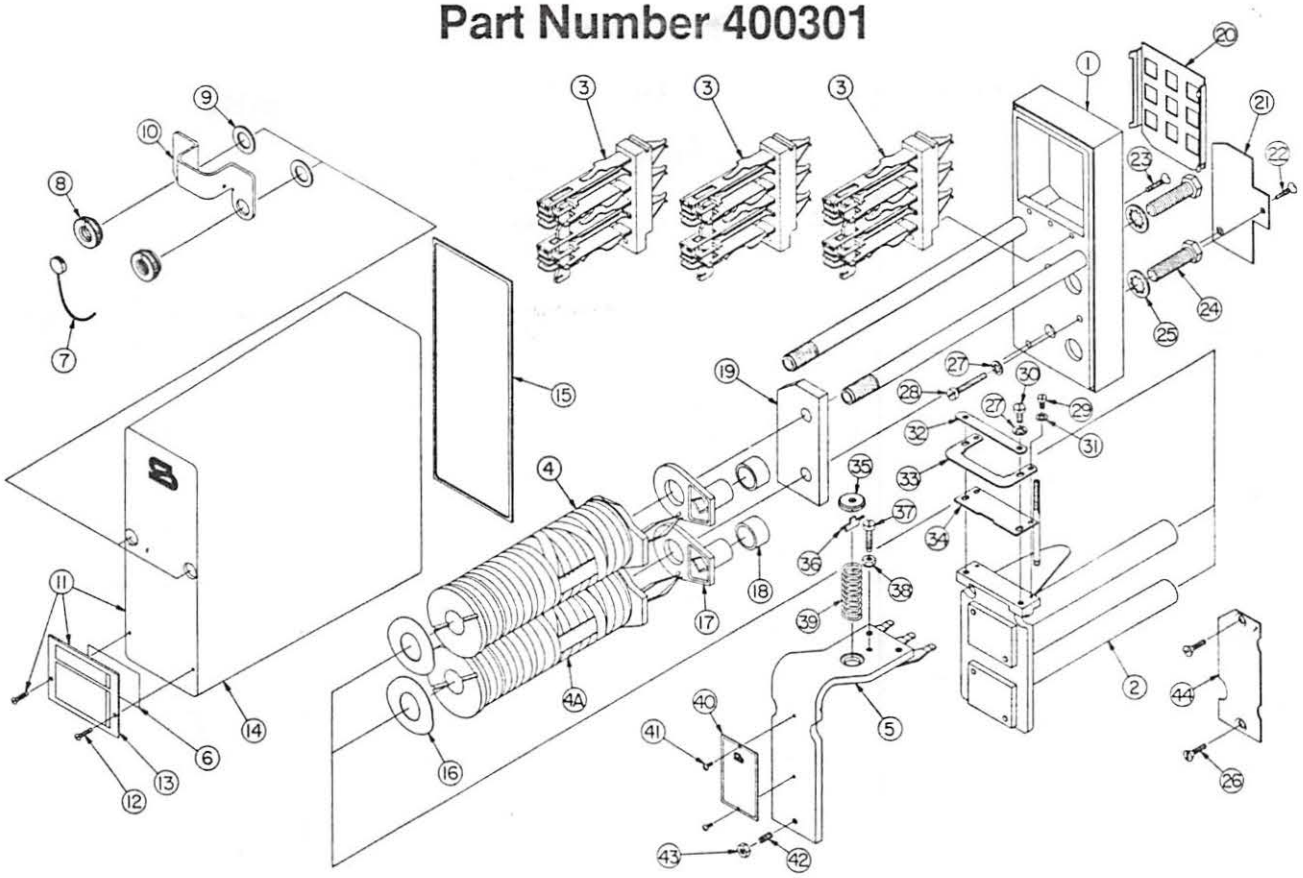
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400301

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400301



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB Contact	3	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
4	Coil Assembly, 450 Ohm	2	420051-4X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4A	Coil Assembly, .2 Ohm	1	420051-5X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	2	420053-7	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	2	420051	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	2	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-4
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-32
21	Plate, Code	1	420050-22	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-52

Safetran Systems Corporation
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I&M # 410000-23
Revised 8/85

Safetran Systems Corporation

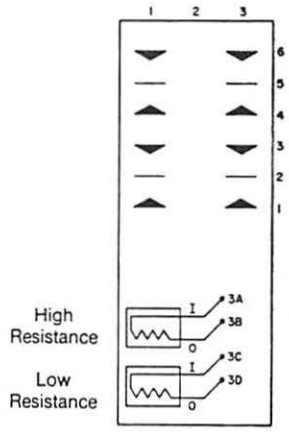
Part Number **400302**

Specification for Type ST Plug-in Relay
Neutral Relay, Light Out
4FB Contacts, 450/.069 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC/VAC w/Rectifier
	Nominal Lamp Load		18-25 Watts
	Resistance/Tolerance		450/.069 Ohms ± 5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	High Resistance		11.5 mA Maximum w/o Rectifier
	Low Resistance		1680 mA Maximum w/o Rectifier
	Speed	Pickup	Regular
Dropaway	High Resistance		6.1 mA Minimum w/o Rectifier
	Low Resistance		860 mA Minimum w/o Rectifier
	Speed	Release	Regular
Contacts	Arrangement		4FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

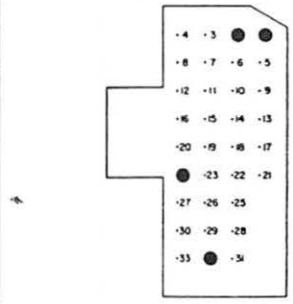
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-24-32

An external Rectifier Stack Assembly, Part Number 400300-1X, must be used with relay for AC or DC lighting operation.
Part Number 400302-X includes Light Out Relay, Part Number 400302, and Rectifier Assembly, Part Number 400300-1X.

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

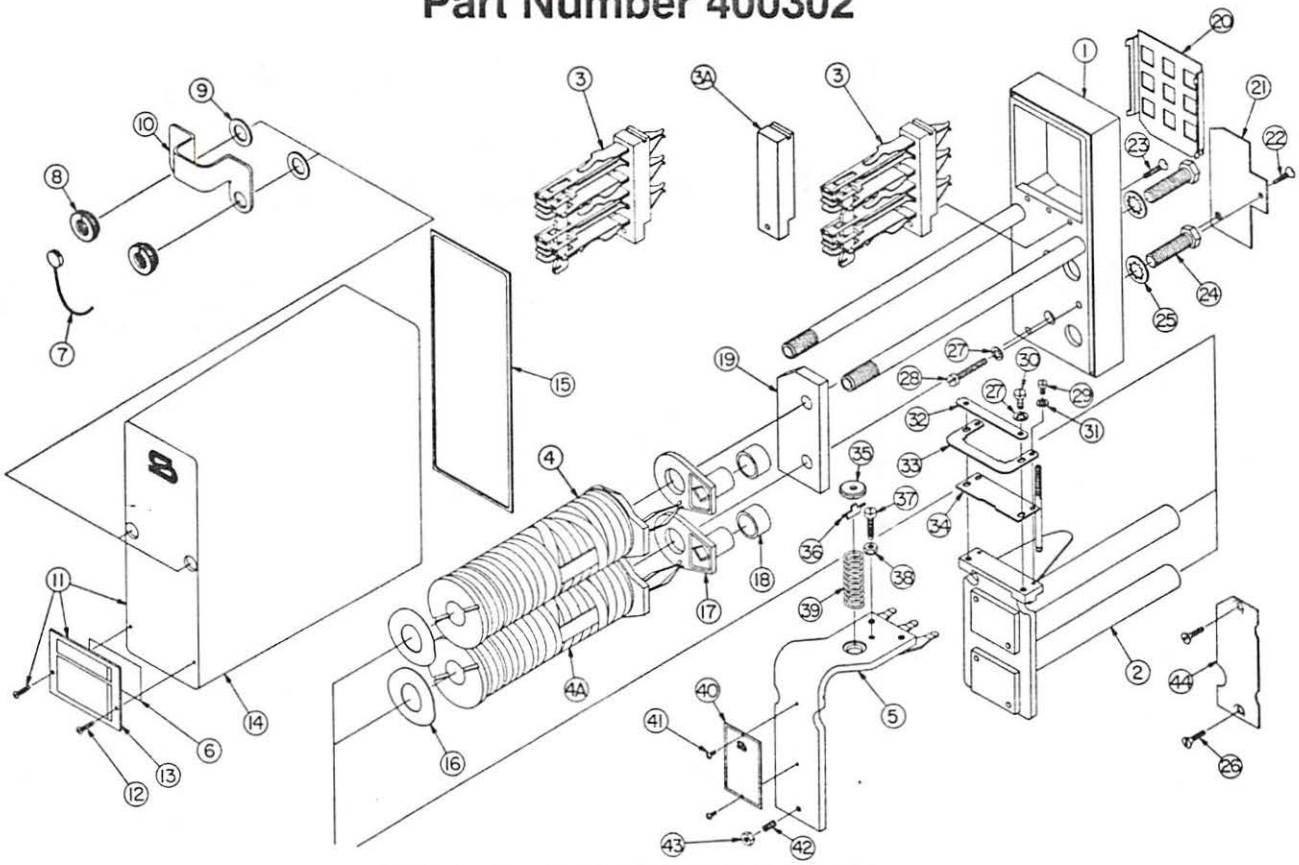
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400302

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400302



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	1	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 450 Ohm	1	420051-4X				
4A	Coil Assembly, .069 Ohm	1	420051-31X	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-7	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-4
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-65
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-510				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-51

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-50
Revised 8/85

Safetran Systems Corporation

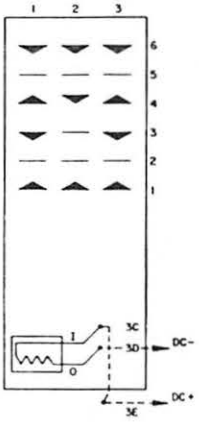
Part Number **400400**

Specification for Type ST Plug-in Relay Neutral Relay, Slow Pickup and Slow Release 4FB-2F-1B Contacts, 194 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		194 Ohms ± 5% (Single Coil)
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		8.9 Volts Maximum
	Current		46 milliamps Maximum
	Speed	Pickup	1.1 Seconds ± 10% Delay @ 10.5 Volts
Dropaway	Voltage		4.07 Volts Minimum
	Current		21 milliamps Minimum
	Speed	Release	0.9 Second ± 10% Delay @ 10.5 Volts
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.005" Minimum
Stop Pin (Fixed)			.003" Minimum

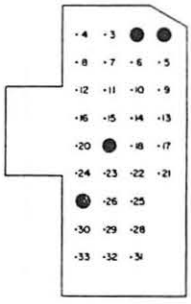
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-19-27

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

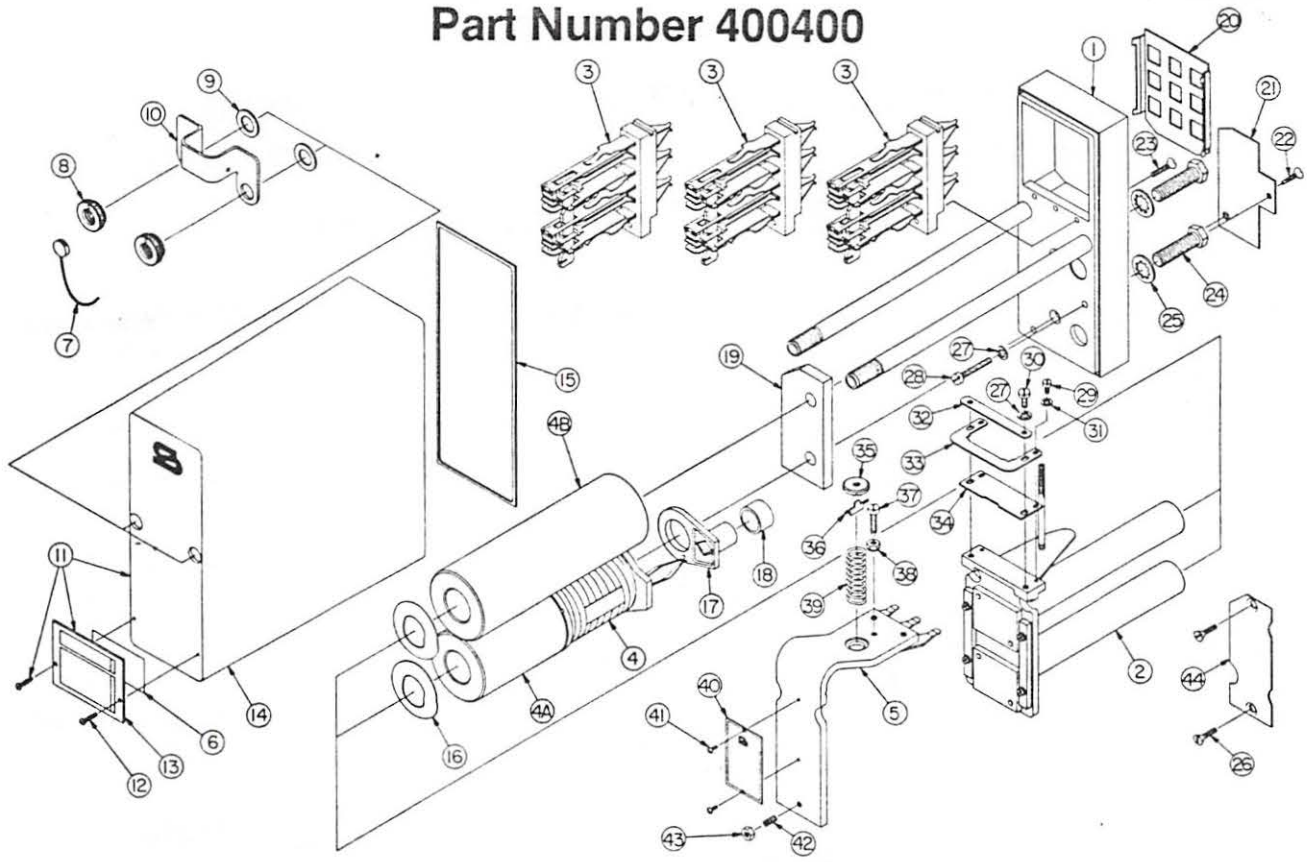
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400400

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400400



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-1X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-8X				
3	Stack, 2FB Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, 2F-1B Contact	1	420052-2X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 194 Ohm	1	420051-8X				
4A	Slug, Copper	1	420051-6	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	1	420051-7	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-42	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	1	420051-8	39	Spring, Compression	1	420053-4
18	Seal, Rubber	1	420051-1	40	Nameplate, Type ST Relay	1	420053-33
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-23	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-53
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

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I&M # 410000-24
Revised 6/83

Safetran Systems Corporation

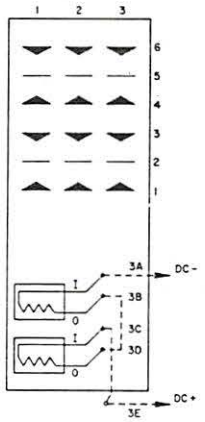
Part Number **400500**

Specification for Type ST Plug-in Relay Biased Neutral Relay, Regular Release 6FB Contacts, 500 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		250 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.05 Volts Maximum
	Current		12.1 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.75 Volts Minimum
	Current		5.5 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.017" Minimum
Stop Pin (Fixed)			.008" Minimum

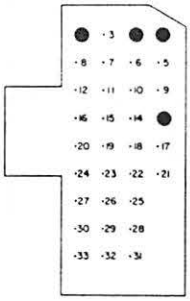
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-4-13

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

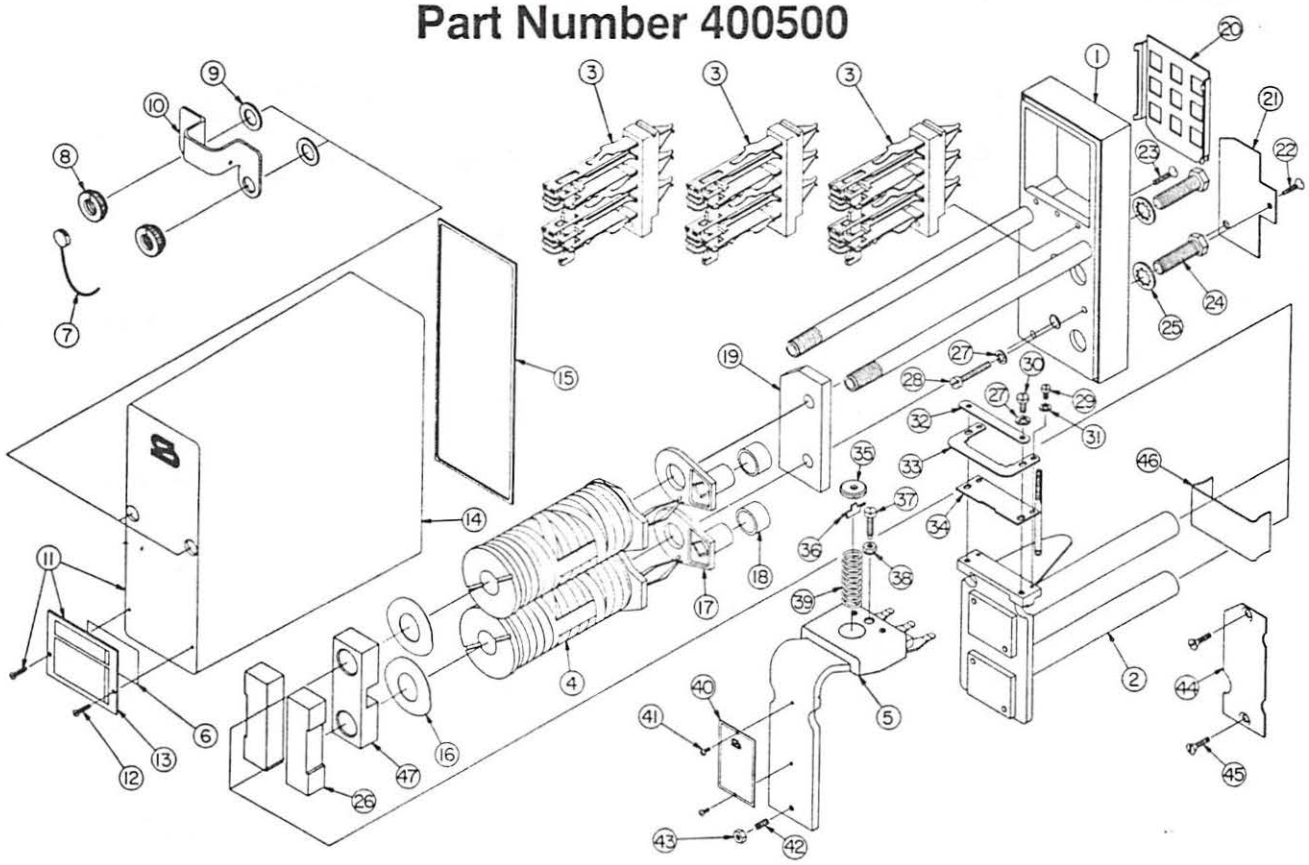
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400500

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400500



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-47
3	Stack, 2FB Contact	3	420052-1X	27	Washer, Spring Lock, I, #8	3	420050-33
4	Coil Assembly, 250 Ohm	2	420051-15X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-5X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-48
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	2	420051	39	Spring, Compression	1	420053-44
18	Seal, Rubber	2	420051-1	40	Nameplate, Type ST Relay	1	420053-34
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-24	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-54
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12	46	Clip, Spring	1	420053-46
				47	Plate, Shunting	1	420053-45

Safetran Systems Corporation
4650 Main Street, N.E.
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612/572-0466

I&M # 410000-25
Revised 6/83

Safetran Systems Corporation

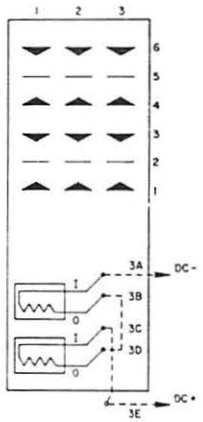
Part Number **400501**

Specification for Type ST Plug-in Relay Biased Neutral Relay, Regular Release 6FB Contacts, 63 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		Special - See Ratings
	Resistance/Tolerance		31.5 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		1.92 Volts Maximum
	Current		30.5 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.88 Volts Minimum
	Current		14 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.017" Minimum
Stop Pin (Fixed)			.008" Minimum

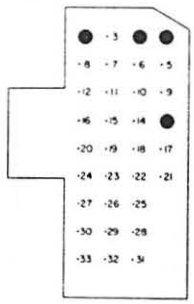
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-4-13

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

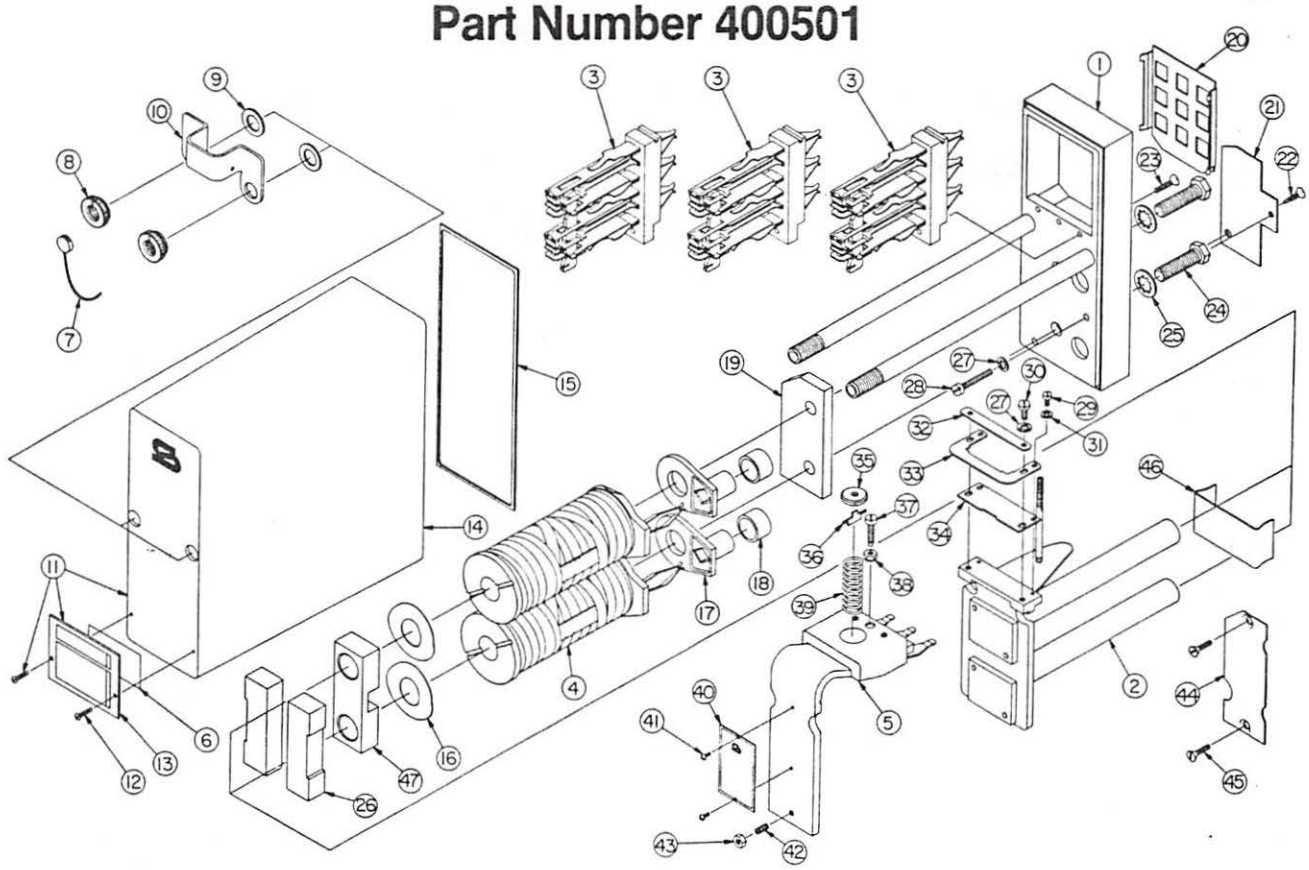
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400501

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400501



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-47
3	Stack, 2FB Contact	3	420052-1X	27	Washer, Spring Lock, I, #8	3	420050-33
4	Coil Assembly, 31.5 Ohm	2	420051-18X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-5X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-48
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	2	420051	39	Spring, Compression	1	420053-44
18	Seal, Rubber	2	420051-1	40	Nameplate, Type ST Relay	1	420053-35
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-25	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-54
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12	46	Clip, Spring	1	420053-46
				47	Plate, Shunting	1	420053-45

Safetran Systems Corporation
4650 Main Street, N.E.
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612/572-0466

I&M # 410000-26
Revised 8/85

Safetran Systems Corporation

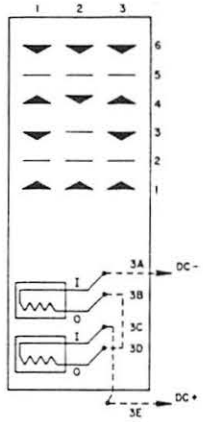
Part Number **400502**

Specification for Type ST Plug-in Relay Biased Neutral Relay, Regular Release 4FB-2F-1B Contacts, 500 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		250 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.05 Volts Maximum
	Current		12.1 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.75 Volts Minimum
	Current		5.5 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.017" Minimum
Stop Pin (Fixed)			.008" Minimum

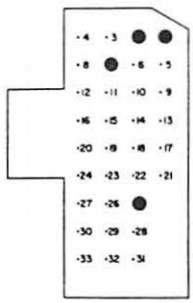
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-7-25

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

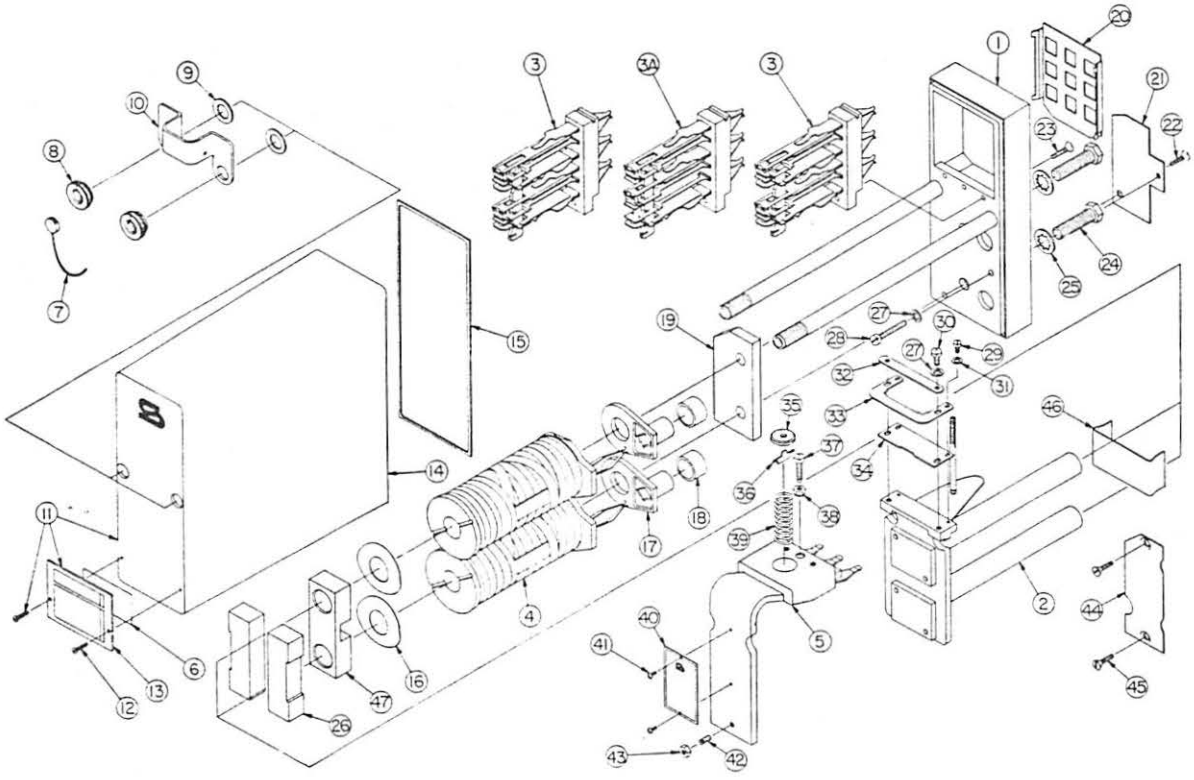
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400502

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400502



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-47
3	Stack, 2FB Contact	2	420052-1X	27	Washer, Spring Lock, I, #8	3	420050-33
3A	Stack, 2F-1B Contact	1	420052-2X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
4	Coil Assembly, 250 Ohm	2	420051-15X				
5	Armature	1	420053-5X	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	31	Washer, Spring Lock, I, #4	2	420053-15
10	Bracket, Cover	1	420050-4	32	Plate, Retainer	1	420053-3
11	Cover Assembly	1	420050-2X	33	Retainer, Armature	1	420053-2
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	34	Plate, Hinge	1	420053-1
				35	Nut, Spring Post	1	420053-6
13	Cover, Nameplate	1	420050-2	36	Key, Spring Retainer	1	420053-5
14	Molded Cover, Clear	1	420050	37	Screw, Tailstop	1	420053-48
15	Gasket, Cover	1	420050-1	38	Nut, Tailstop	1	420053-8
16	Washer, Spring	2	420053-7	39	Spring, Compression	1	420053-44
17	Insulator, Terminal Retainer	2	420051	40	Nameplate, Type ST Relay	1	420053-49
18	Seal, Rubber	2	420051-1	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
19	Plate, Base	1	420053				
20	Seal, Dust	1	420052	42	Screw, Residual	1	420053-11
21	Plate, Code	1	420050-511	43	Nut, Residual	1	420053-10
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	44	Plate, Code Pin	1	420050-56
				45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				
				46	Clip, Spring	1	420053-46
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12	47	Plate, Shunting	1	420053-45

I&M # 410000-33
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

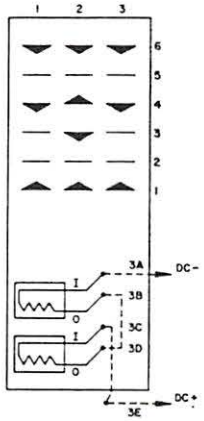
Part Number **400503**

Specification for Type ST Plug-in Relay Biased Neutral Relay, Regular Release 2FB-4F-2B Contacts, 1000 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		12-16 VDC
	Resistance/Tolerance		500 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		8.8 Volts Maximum
	Current		8.8 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		4.1 Volts Minimum
	Current		4.1 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		2FB-4F-2B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.017" Minimum
Stop Pin (Fixed)			.008" Minimum

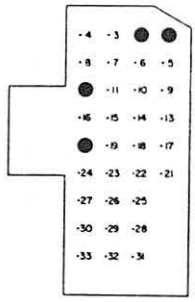
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-12-20

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

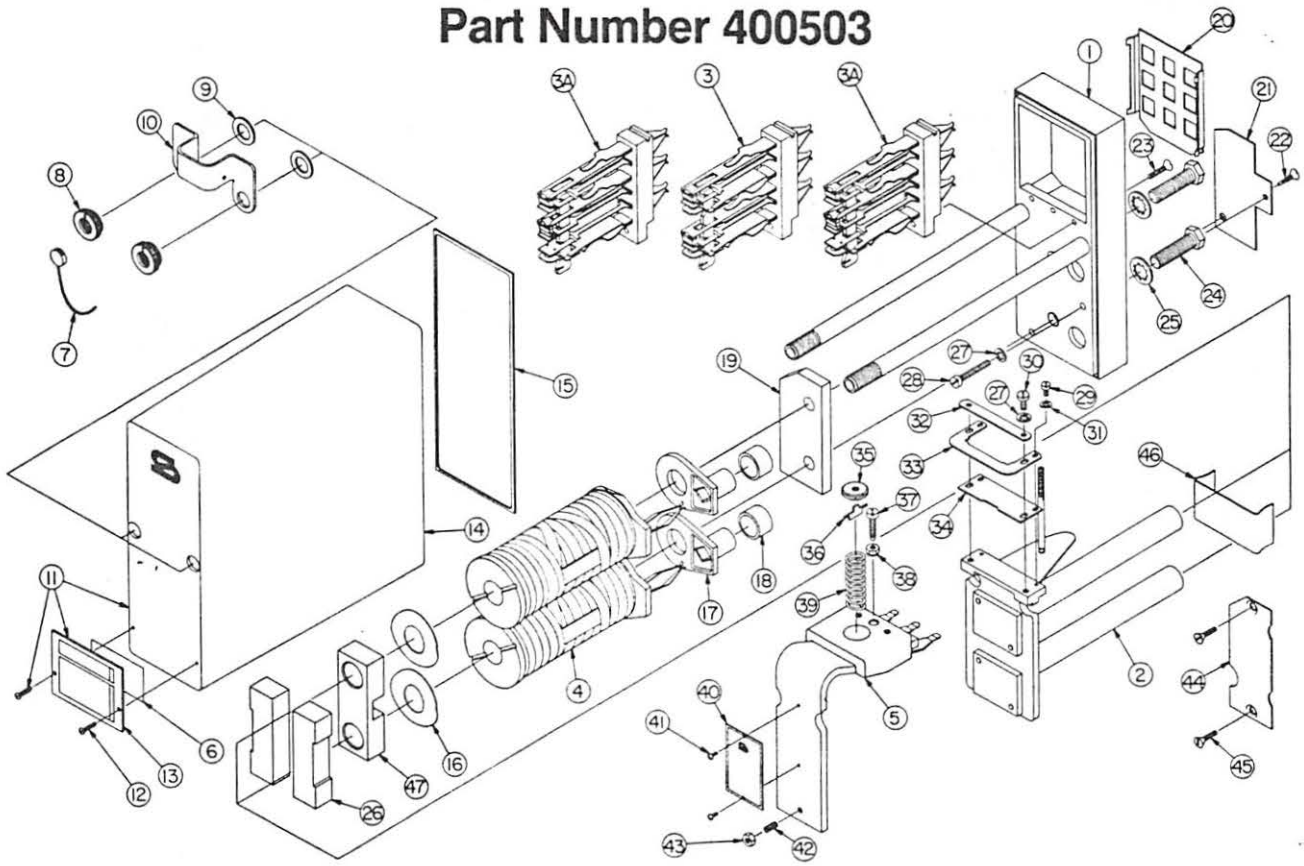
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400503

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400503



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-47
3	Stack, 2FB Contact	1	420052-1X	27	Washer, Spring Lock, I, #8	3	420050-33
3A	Stack, 2F-1B Contact	2	420052-2X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
4	Coil Assembly, 500 Ohm	2	420051-23X				
5	Armature	1	420053-5X	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	31	Washer, Spring Lock, I, #4	2	420053-15
10	Bracket, Cover	1	420050-4	32	Plate, Retainer	1	420053-3
11	Cover Assembly	1	420050-2X	33	Retainer, Armature	1	420053-2
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	34	Plate, Hinge	1	420053-1
				35	Nut, Spring Post	1	420053-6
13	Cover, Nameplate	1	420050-2	36	Key, Spring Retainer	1	420053-5
14	Molded Cover, Clear	1	420050	37	Screw, Tailstop	1	420053-48
15	Gasket, Cover	1	420050-1	38	Nut, Tailstop	1	420053-8
16	Washer, Spring	2	420053-7	39	Spring, Compression	1	420053-44
17	Insulator, Terminal Retainer	2	420051	40	Nameplate, Type ST Relay	1	420053-50
18	Seal, Rubber	2	420051-1	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
19	Plate, Base	1	420053				
20	Seal, Dust	1	420052	42	Screw, Residual	1	420053-11
21	Plate, Code	1	420050-512	43	Nut, Residual	1	420053-10
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	44	Plate, Code Pin	1	420050-63
				45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				
				46	Clip, Spring	1	420053-46
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12	47	Plate, Shunting	2	420053-45

I&M # 410000-40
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

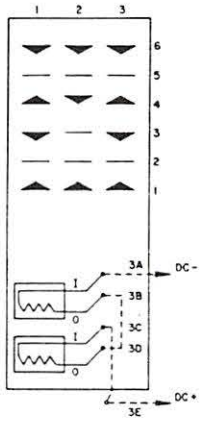
Part Number **400504**

Specification for Type ST Plug-in Relay Biased Neutral Relay, Regular Release 4FB-2F-1B Contacts, 100 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		50 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		2.6 Volts Maximum
	Current		26 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		1.3 Volts Minimum
	Current		13 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.017" Minimum
Stop Pin (Fixed)			.008" Minimum

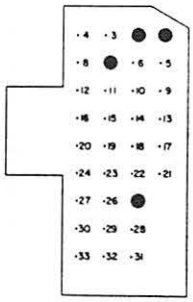
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-7-25

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

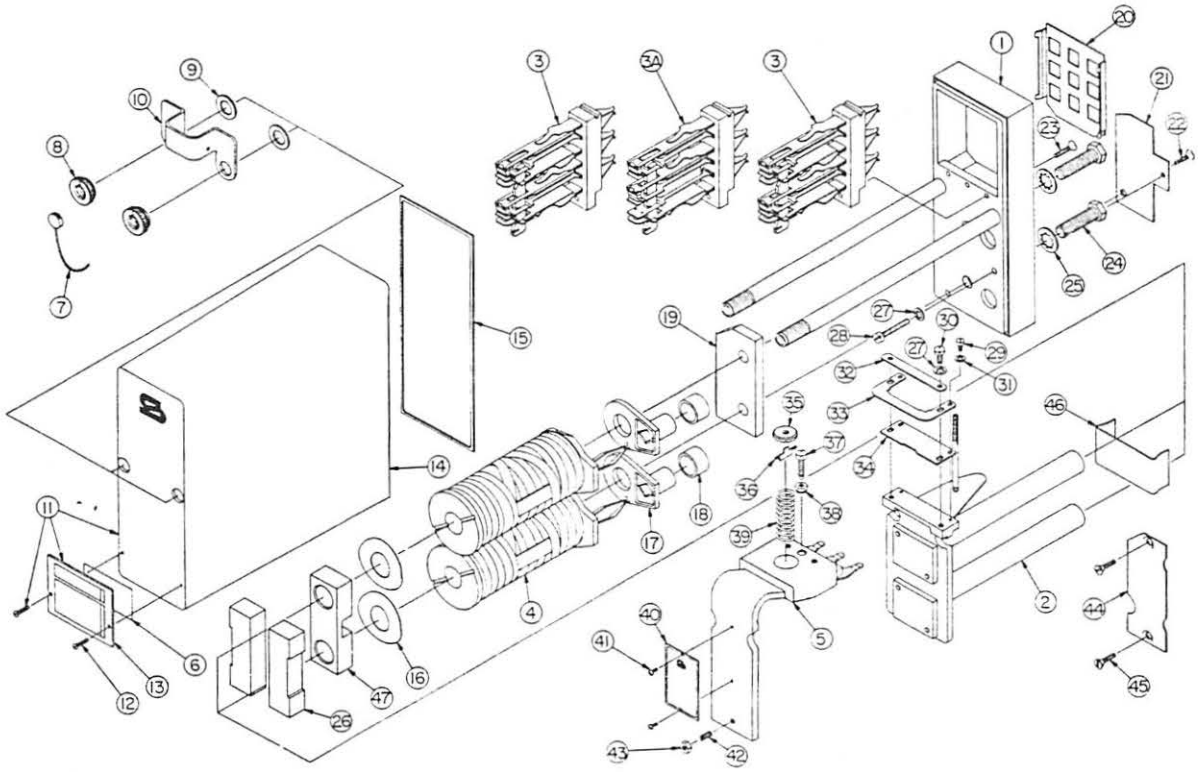
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400504

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400504



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-47
3	Stack, 2FB Contact	2	420052-1X	27	Washer, Spring Lock, I, #8	3	420050-33
3A	Stack, 2F-1B Contact	1	420052-2X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
4	Coil Assembly, 50 Ohm	2	420051-26X				
5	Armature	1	420053-5X	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	31	Washer, Spring Lock, I, #4	2	420053-15
10	Bracket, Cover	1	420050-4	32	Plate, Retainer	1	420053-3
11	Cover Assembly	1	420050-2X	33	Retainer, Armature	1	420053-2
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	34	Plate, Hinge	1	420053-1
				35	Nut, Spring Post	1	420053-6
13	Cover, Nameplate	1	420050-2	36	Key, Spring Retainer	1	420053-5
14	Molded Cover, Clear	1	420050	37	Screw, Tailstop	1	420053-48
15	Gasket, Cover	1	420050-1	38	Nut, Tailstop	1	420053-8
16	Washer, Spring	2	420053-7	39	Spring, Compression	1	420053-44
17	Insulator, Terminal Retainer	2	420051	40	Nameplate, Type ST Relay	1	420053-54
18	Seal, Rubber	2	420051-1	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
19	Plate, Base	1	420053				
20	Seal, Dust	1	420052	42	Screw, Residual	1	420053-11
21	Plate, Code	1	420050-513	43	Nut, Residual	1	420053-10
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	44	Plate, Code Pin	1	420050-56
				45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	46	Clip, Spring	1	420053-46
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12	47	Plate, Shunting	1	420053-45

I&M # 410000-41
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

GWL

SAFETRAN SYSTEMS CORPORATION
LOUISVILLE DIVISION
7721 NATIONAL TURNPIKE • LOUISVILLE, KENTUCKY 40214
502/361-9261 TWX 810-535-3325

September 30. 1985

POTTER AND BRUMFIELD
Post Office Box 322
Princeton, Indiana 47671

ATTENTION: Carol Slinker

Dear Ms. Slinker:

Reference is made to our discussion concerning P & B's manufacturing an ST Relay Part No. 400500 relay with heavy duty contacts.

For your information and evaluation, enclosed is a preliminary plan of the proposed relay, Part No. 400500S. It would appear, on the surface, that the present 400500 relay could be altered utilizing some of the parts from the 400800 relay to create the heavy duty feature.

Per your request, I have enclosed a GRS Catalogue reference of their relay, Part No. A62-613, which is what is needed except that the contact arrangement should be the same as our relay, Part No. 400500.

Yours very truly,

G.W. Lash

G.W. Lash
Manager Materials

GWL:lar

Enclosures

Safetran Systems Corporation

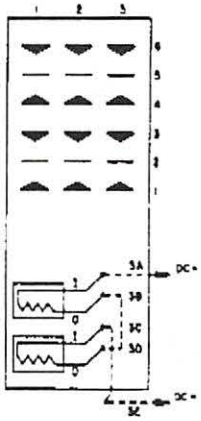
Part Number **400505**

Specification for Type ST Plug-in Relay
Biased Neutral Relay, Regular Release
6FB HD Contacts, 500 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		250 Ohms ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.05 Volts Maximum
	Current		12.1 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.75 Volts Minimum
	Current		5.5 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		6FB HD
	Rating		15 Amps/15 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.017" Minimum
Stop Pin (Fixed)			.008" Minimum

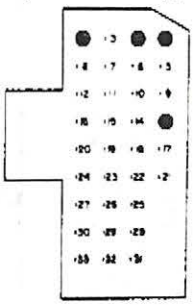
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-4-13

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

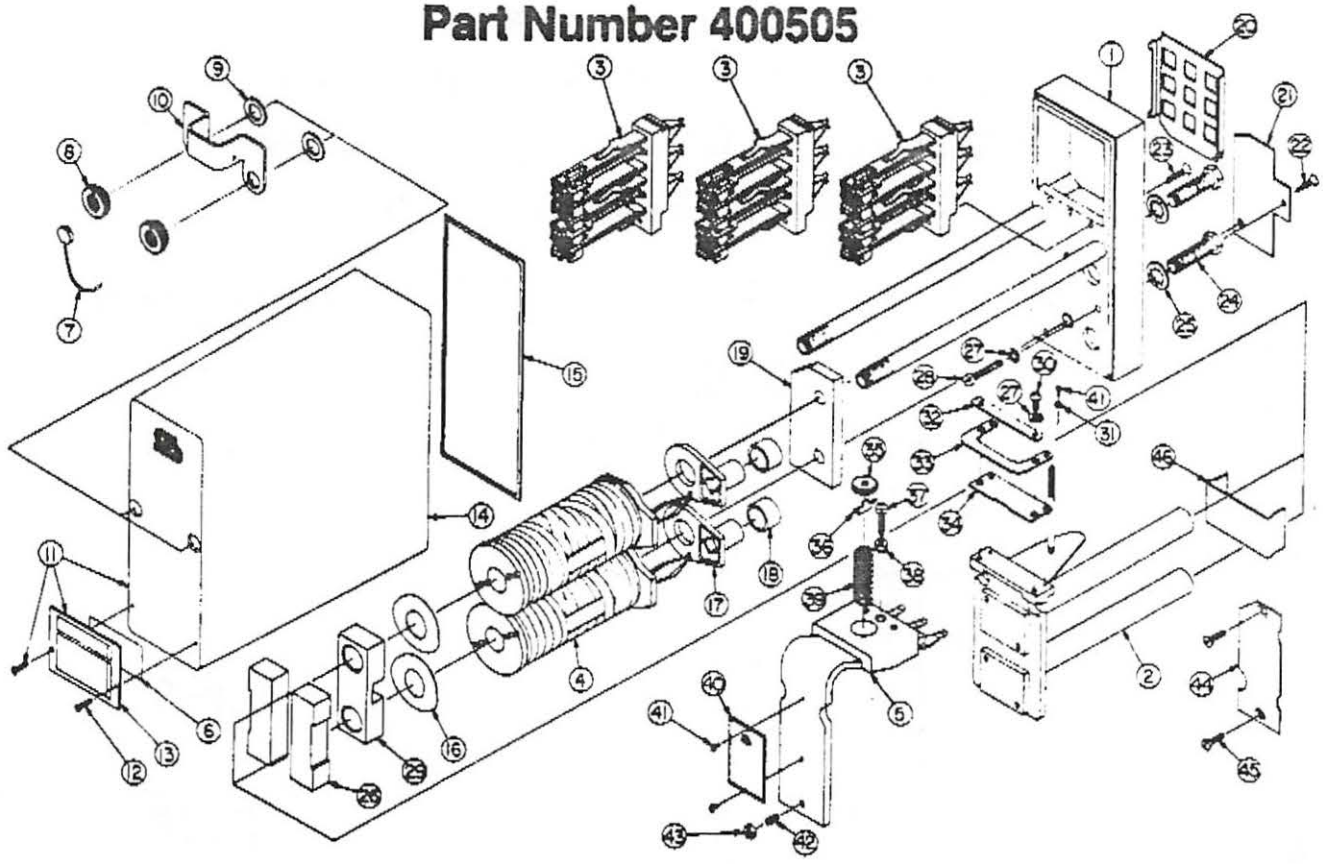
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400505

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400505



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-47
3	Stack, 2FB HD Contact	3	420052-3X	27	Washer, Spring Lock, I, #8	3	420050-33
4	Coil Assembly, 250 Ohm	2	420051-15X	28	Machine Screw, Fillister Head, #6-32 X .937"	1	420050-32
5	Armature	1	420053-5X				
6	Label, Paper Identification	1	420050-3	29	Plate, Shunting	1	420053-45
7	Seal, Lead	1	420050-8	30	Machine Screw, Pan Head, #8-32 X .375"	2	420053-16
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	31	Washer, Spring Lock, I, #4	2	420053-15
10	Bracket, Cover	1	420050-4	32	Plate, Retainer	1	420053-3
11	Cover Assembly	1	420050-2X	33	Retainer, Armature	1	420053-2
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	34	Plate, Hinge	1	420053-1
				35	Nut, Spring Post	1	420053-6
13	Cover, Nameplate	1	420050-2	36	Key, Spring Retainer	1	420053-5
14	Molded Cover, Clear	1	420050	37	Screw, Tailstop	1	420053-48
15	Gasket, Cover	1	420050-1	38	Nut, Tailstop	1	420053-8
16	Washer, Spring	2	420053-7	39	Spring, Compression	1	420053-44
17	Insulator, Terminal Retainer	2	420051	40	Nameplate, Type ST Relay	1	420053-68
18	Seal, Rubber	2	420051-1	41	Machine Screw, Pan Head, #4-40 X .187"	4	420053-18
19	Plate, Base	1	420053				
20	Seal, Dust	1	420052	42	Screw, Residual	1	420053-11
21	Plate, Code	1	420050-51B	43	Nut, Residual	1	420053-10
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	44	Plate, Code Pin	1	420050-54
				45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	46	Clip, Spring	1	420053-46
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420063-12				

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-53
Revised 3/86

Safetran Systems Corporation

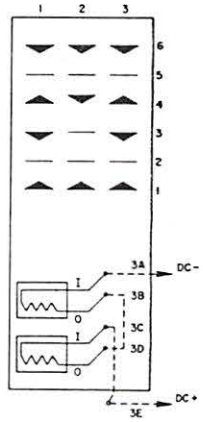
Part Number **400510**

Specification for Type ST Plug-in Relay
Biased Neutral Track Relay
4FB-2F-1B Contacts, 2 Ohm

	Characteristic		Original Requirements
Coils	Nominal V or I		175-200 mADC
	Resistance/Tolerance		1 Ohm ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		.316 Volts Maximum
	Current		158 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.146 Volts Minimum
	Current		73 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB-2F-1B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.017" Minimum
Stop Pin (Fixed)			.008" Minimum

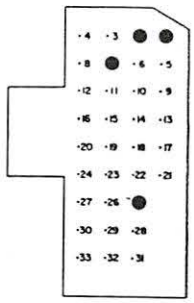
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-7-25

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

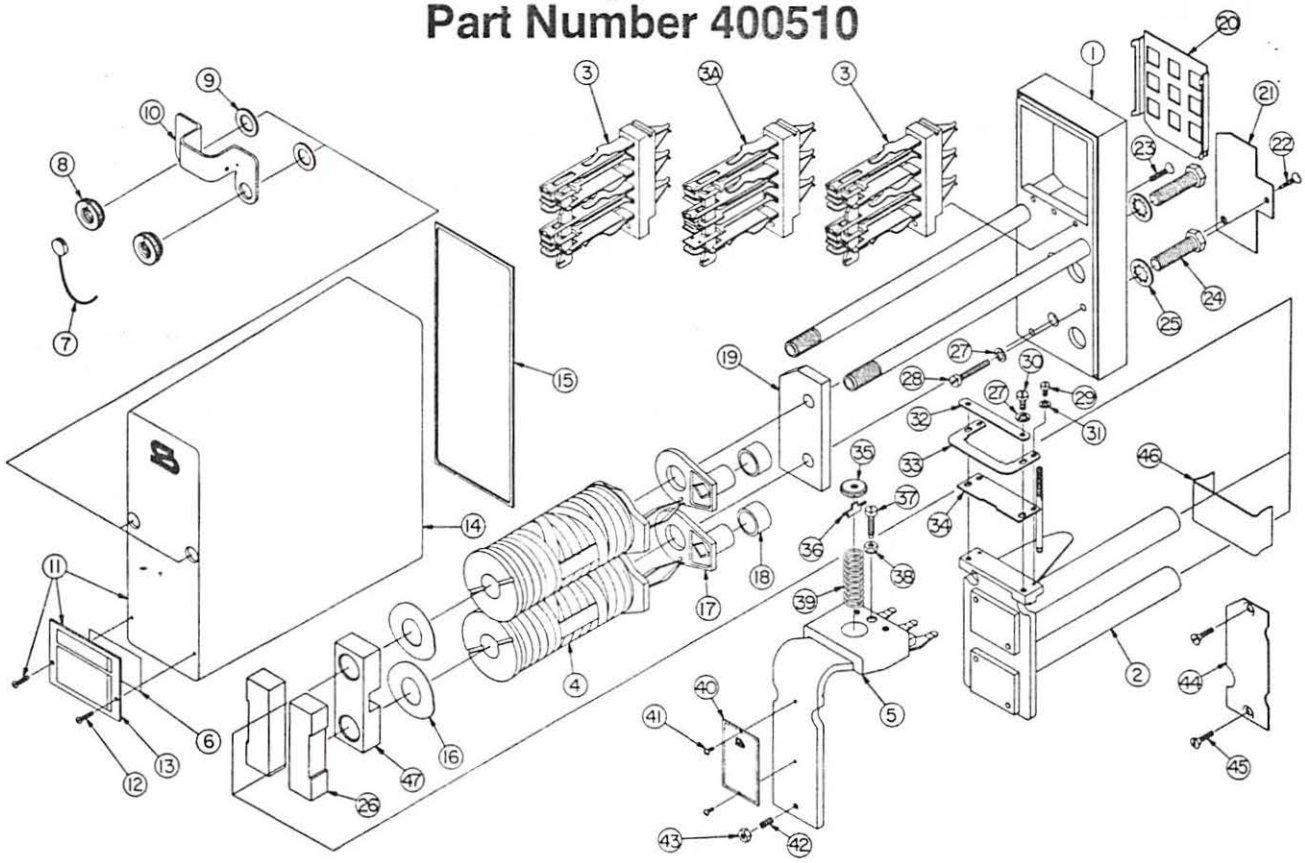
Drop Away Value — Not less than 85% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400510

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400510



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-47
3	Stack, 2FB Contact	2	420052-1X	27	Washer, Spring Lock, I, #8	3	420050-33
3A	Stack, 2F-1B Contact	1	420052-2X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
4	Coil Assembly, 1 Ohm	2	420051-17X				
5	Armature	1	420053-5X	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	31	Washer, Spring Lock, I, #4	2	420053-15
10	Bracket, Cover	1	420050-4	32	Plate, Retainer	1	420053-3
11	Cover Assembly	1	420050-2X	33	Retainer, Armature	1	420053-2
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	34	Plate, Hinge	1	420053-1
				35	Nut, Spring Post	1	420053-6
13	Cover, Nameplate	1	420050-2	36	Key, Spring Retainer	1	420053-5
14	Molded Cover, Clear	1	420050	37	Screw, Tailstop	1	420053-48
15	Gasket, Cover	1	420050-1	38	Nut, Tailstop	1	420053-8
16	Washer, Spring	2	420053-7	39	Spring, Compression	1	420053-44
17	Insulator, Terminal Retainer	2	420051	40	Nameplate, Type ST Relay	1	420053-36
18	Seal, Rubber	2	420051-1	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
19	Plate, Base	1	420053				
20	Seal, Dust	1	420052	42	Screw, Residual	1	420053-11
21	Plate, Code	1	420050-26	43	Nut, Residual	1	420053-10
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	44	Plate, Code Pin	1	420050-56
				45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				
				46	Clip, Spring	1	420053-46
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12	47	Plate, Shunting	2	420053-45

I&M # 410000-27
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

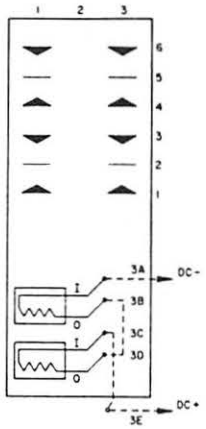
Part Number **400511**

Specification for Type ST Plug-in Relay
Biased Neutral Track Relay
High P.U./D.A. Ratio
4FB Contacts, .5 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		400-450 mADC — Coils in Parallel
	Resistance/Tolerance		1 Ohm ± 5% each coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		.183 Volts Maximum
	Current		365 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		.128 Volts Minimum
	Current		256 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment F		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.035" Minimum
Stop Pin (Fixed)			.008" Minimum

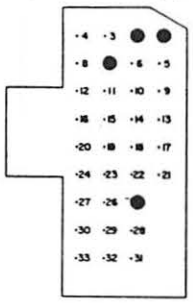
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-7-25

Notes

#1 N.O. Contacts to make with .029" and break with .034" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

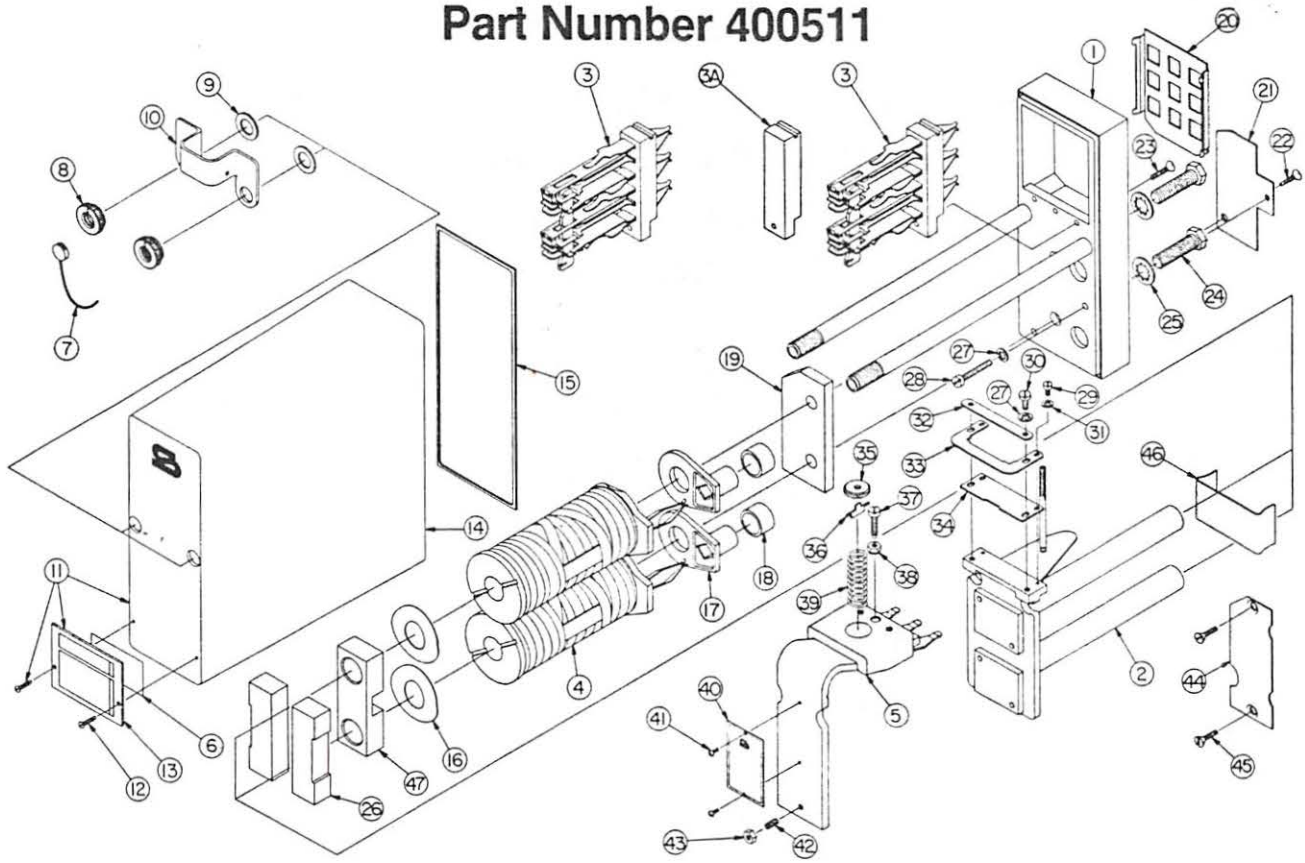
Drop Away Value — Not less than 85% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400511

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400511



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-47
3	Stack, 2FB Contact	2	420052-1X	27	Washer, Spring Lock, I, #8	3	420050-33
3A	Stack, Blank	1	420052-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
4	Coil Assembly, 1 Ohm	2	420051-17X				
5	Armature	1	420053-5X	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	31	Washer, Spring Lock, I, #4	2	420053-15
10	Bracket, Cover	1	420050-4	32	Plate, Retainer	1	420053-3
11	Cover Assembly	1	420050-2X	33	Retainer, Armature	1	420053-2
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	34	Plate, Hinge	1	420053-1
				35	Nut, Spring Post	1	420053-6
13	Cover, Nameplate	1	420050-2	36	Key, Spring Retainer	1	420053-5
14	Molded Cover, Clear	1	420050	37	Screw, Tailstop	1	420053-48
15	Gasket, Cover	1	420050-1	38	Nut, Tailstop	1	420053-8
16	Washer, Spring	2	420053-7	39	Spring, Compression	1	420053-44
17	Insulator, Terminal Retainer	2	420051	40	Nameplate, Type ST Relay	1	420053-56
18	Seal, Rubber	2	420051-1	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
19	Plate, Base	1	420053				
20	Seal, Dust	1	420052	42	Screw, Residual	1	420053-11
21	Plate, Code	1	420050-514	43	Nut, Residual	1	420053-10
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	44	Plate, Code Pin	1	420050-56
				45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				
				46	Clip, Spring	1	420053-46
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12	47	Plate, Shunting	2	420053-45

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-42
Revised 8/85

Safetran Systems

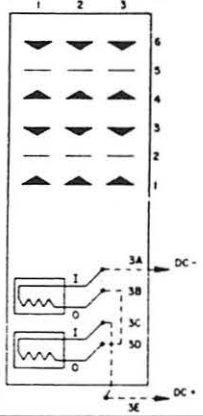
Part Number **400516**

Specification for Type ST Plug-in Relay Biased Neutral Relay, Regular Release 6FB Contacts, 800 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		400 Ohms ±5% Each Coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		7.04 Volts Maximum
	Current		8.8 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		3.2 Volts Minimum
	Current		4.0 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		6FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment C		*See Notes Below
	Resistance	N.O.	90 milliohms Maximum @10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.017" Minimum
Stop Pin (Fixed)			.008" Minimum

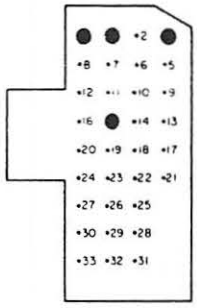
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-3-4-15

Notes

#1 N.O. Contacts to make with .025" and break with .030" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

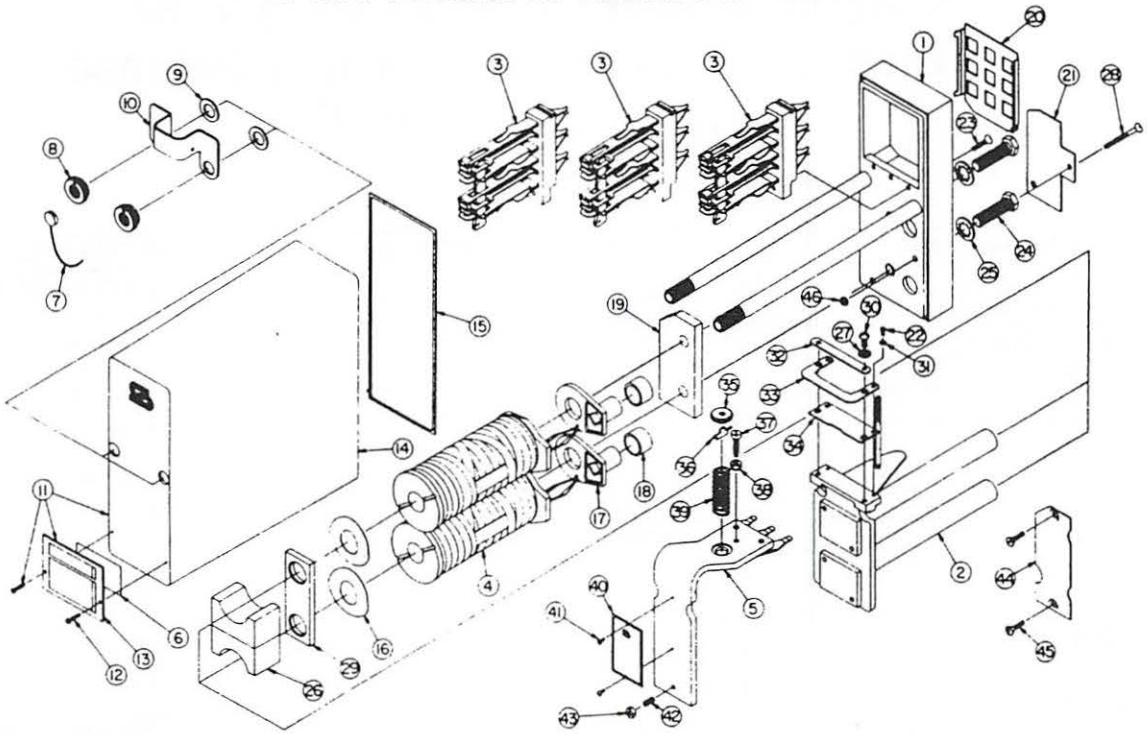
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400516

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400516



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number	Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-47
3	Stack, 2F Contact	3	420052-1X	27	Washer, Spring Lock, I, #8	2	420050-33
4	Coil Assembly, 400 Ohm	2	420051-16X	28	Screw, Flat Head,		
5	Armature	1	420053-1X		#8-32 X 1.185"	1	420053-88
6	Label, Paper Identification	1	420050-3	29	Plate, Shunting	1	420053-45
7	Seal, Lead	1	420050-8	30	Machine Screw, Pan Head,		
8	Nut, Knurl, Locking	2	420050-5		#8-32 X .375"	2	420053-16
9	Washer, Flat Rubber	2	420050-7	31	Washer, Spring Lock, I, #4	2	420053-15
10	Bracket, Cover	1	420050-4	32	Plate, Retainer	1	420053-3
11	Cover Assembly	1	420050-2X	33	Retainer, Armature	1	420053-2
12	Tap Screw, Round Head,			34	Plate, Hinge	1	420053-1
	#4 X .375"	2	420050-35	35	Nut, Spring Post	1	420053-6
13	Cover, Nameplate	1	420050-2	36	Key, Spring Retainer	1	420053-5
14	Molded Cover, Clear	1	420050	37	Screw, Tailstop	1	420053-9
15	Gasket, Cover	1	420050-1	38	Nut, Tailstop	1	420053-8
16	Washer, Spring	2	420053-7	39	Spring, Compression	1	420053-4
17	Insulator, Terminal Retainer	2	420051	40	Nameplate, Type ST Relay	1	420053-75
18	Seal, Rubber	2	420051-1	41	Phillips Screw, Pan Head,		
19	Plate, Base	1	420053		#4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052	42	Screw, Residual	1	420053-11
21	Plate, Code	1	420050-531	43	Nut, Residual	1	420053-10
22	Machine Screw, Fillister Head,			44	Plate, Code Pin	1	420050-121
	#4-40 X .250"	2	420053-14	45	Machine Screw, Flat Head,		
23	Machine Screw, Flat Head,				#6-32 X .5"	2	420050-36
	#6-32 X .531"	3	420050-36	46	Nut, Hex, #8-32 X .345"	1	420053-8
24	Machine Screw, Hex Head,						
	5/16"-24 X 1.125"	2	420053-12				

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I&M # 410000-79
Revised 11/94

Safetran Systems

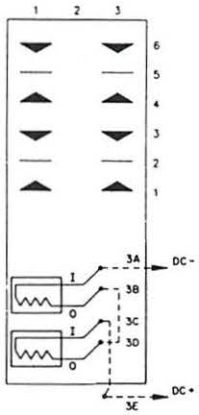
Part Number **400517**

Specification for Type ST Plug-in Relay
Biased Neutral Relay
High D.A./ P.U. Ratio
4FB Contacts, 2000 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		18-24 Volts
	Resistance/Tolerance		1000 Ohms ±5% Each Coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		12 Volts Maximum
	Current		6 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		9.0 Volts Minimum
	Current		4.5 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		4FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel per Adjustment F		*See Notes Below
	Resistance	N.O.	90 milliohms Maximum @10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @10 VDC, 1.0 Amps
Armature Travel			.073" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.020" Minimum Top Core .040" Minimum Bottom Core
Stop Pin (Fixed)			.008" Minimum

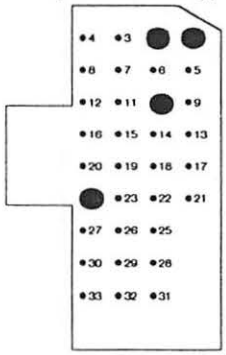
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-10-24

Notes

#1 N.O. Contacts to make with .029" and break with .034" between armature residual screw and core. N.C. Contacts to make with .057" and break with .052" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

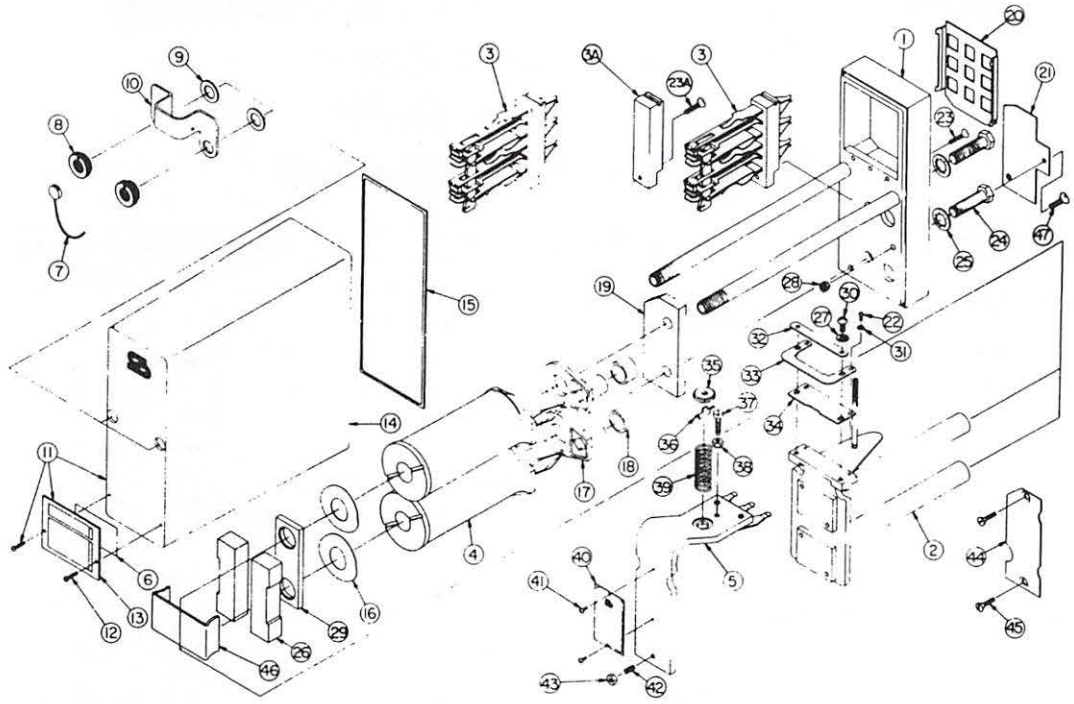
Drop Away Value — Not less than 85% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400517

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400517



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number	Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-71X				
3	Stack, 2F Contact	2	420052-1X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank	1	420052-3	26	Magnet	2	420053-47
4	Coil Assembly, 1000 Ohm	2	420051-51X	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-5X	28	Nut, Hex, #8-32 X .345"	1	420053-8
6	Label, Paper Identification	1	420050-3	29	Plate, Shunting	2	420053-79
7	Seal, Lead	1	420050-8	30	Machine Screw, Pan Head, #8-32 X .375"	2	420053-16
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	31	Washer, Spring Lock, I, #4	2	420053-15
10	Bracket, Cover	1	420050-4	32	Plate, Retainer	1	420053-3
11	Cover Assembly	1	420050-2X	33	Retainer, Armature	1	420053-2
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	34	Plate, Hinge	1	420053-1
				35	Nut, Spring Post	1	420053-6
13	Cover, Nameplate	1	420050-2	36	Key, Spring Retainer	1	420053-5
14	Molded Cover, Clear	1	420050	37	Screw, Tailstop	1	420053-9
15	Gasket, Cover	1	420050-1	38	Nut, Tailstop	1	420053-8
16	Washer, Spring	2	420053-7	39	Spring, Compression	1	420053-43
17	Insulator, Terminal Retainer	2	420051	40	Nameplate, Type ST Relay	1	420053-146
18	Seal, Rubber	2	420051-1	41	Phillips Screw, Pan Head, #4-40 X .187"	2	420053-18
19	Plate, Base	1	420053				
20	Seal, Dust	1	420052	42	Screw, Residual	1	420053-11
21	Plate, Code	1	420050-544	43	Nut, Residual	1	420053-10
22	Machine Screw, Fillister Head, #4-40 X .250"	2	420053-14	44	Plate, Code Pin	1	420050-133
				45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
23	Machine Screw, Flat Head, #6-32 X .531"	2	420050-36	46	Clip, Spring	1	420053-46
23A	Machine Screw, Flat Head, #6-32 X .375"	1	420052-2	47	Screw, Flat Head, #8-32 X .345"	1	420053-88

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I&M # 410000-97
Revised 7/95

Safetran Systems

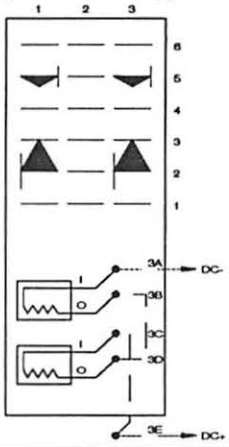
Part Number **400520**

Specification for Type ST Plug-in Relay
Biased Neutral Relay, Switch Control
2F-2B EHD Magnetic Blowout Contacts, 500 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		250 Ohms ±5% Each Coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		9.5 Volts Maximum
	Current		19 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		3.8 Volts Minimum
	Current		7.6 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		2F-2B EHD Magnetic Blowout
	*Rating		15 Amps/30 Volts
	Material	N.O.	SCdO – SCdO
		N.C.	SCdO – SCdO
	Dynamic Gap		.100" Minimum
	Contact Gap		.125" Minimum
	Pressure	N.O.	90 Grams Minimum
		N.C.	25 Grams Minimum
	Overtravel per Adjustment B		*See Notes Below
	Resistance	N.O.	30 milliohms Maximum @10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @10 VDC, 1.0 Amps
Armature Travel			.140" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.024" Minimum
Stop Pin (Fixed)			.008" Minimum

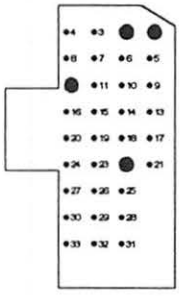
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-12-22

*15 Amps @ 125 VDC and 175 VAC when used with magnetic blowout contacts for ARC suppression.

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .119" and break with .112" between armature residual screw and core.

#2 Adjust armature compression spring to have one ounce (28.4 grams) minimum at the adjustable residual screw to just raise the armature stop screw from its stop.

Field Requirements

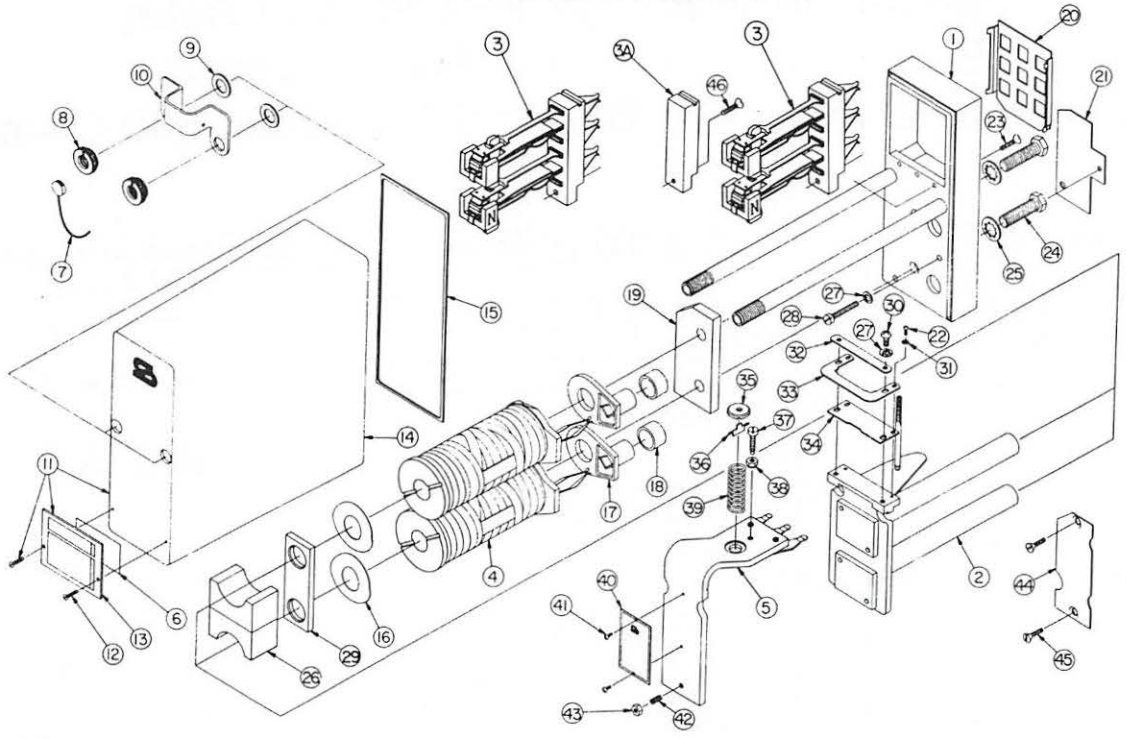
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400520

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400520



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number	Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Magnet	2	420053-80
3	Stack, 1F-1B EHD Contact	2	420052-7X	27	Washer, Spring Lock, I, #8	3	420050-33
3A	Stack, Blank Contact	1	420052-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
4	Coil Assembly, 250 Ohm	2	420051-15X				
5	Armature	1	420053-1X	29	Plate, Shunting	2	420053-79
6	Label, Paper Identification	1	420050-3	30	Machine Screw, Pan Head, #8-32 X .375"	2	420053-16
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	31	Washer, Spring Lock, I, #4	2	420053-15
9	Washer, Flat Rubber	2	420050-7	32	Plate, Retainer	1	420053-3
10	Bracket, Cover	1	420050-4	33	Retainer, Armature	1	420053-2
11	Cover Assembly	1	420050-2X	34	Plate, Hinge	1	420053-1
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	35	Nut, Spring Post	1	420053-6
				36	Key, Spring Retainer	1	420053-5
13	Cover, Nameplate	1	420050-2	37	Screw, Tailstop	1	420053-9
14	Molded Cover, Clear	1	420050	38	Nut, Tailstop	1	420053-8
15	Gasket, Cover	1	420050-1	39	Spring, Compression	1	420053-4
16	Washer, Spring	2	420053-7	40	Nameplate, Type ST Relay	1	420053-37
17	Insulator, Terminal Retainer	2	420051	41	Phillips Screw, Pan Head, #4-40 X .187"	2	420053-18
18	Seal, Rubber	2	420051-1				
19	Plate, Base	1	420053	42	Screw, Residual	1	420053-11
20	Seal, Dust	1	420052	43	Nut, Residual	1	420053-10
21	Plate, Code	1	420050-27	44	Plate, Code Pin	1	420050-57
22	Machine Screw, Fillister Head, #4-40 X .250"	2	420053-14	45	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
23	Machine Screw, Flat Head, #6-32 X .531"	2	420050-36	46	Machine Screw, Flat Head, #6-32 X .375"	1	420052-2
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12				

Safetran Systems Corporation
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612/572-0466

I&M # 410000-28
Revised 4/94

Safetran Systems Corporation

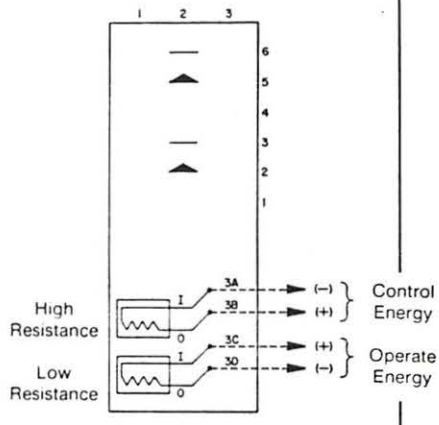
Part Number **400600**

Specification for Type ST Plug-in Relay
Neutral Relay, Switch Overload
2B EHD Magnetic Blowout Contacts, .068/1225 Ohm
Overload Rating 12 Amps, High Voltage Machine

Characteristic			Original Requirements
Coils	Nominal V or I		Special - See Ratings
	Resistance/Tolerance		.068/1225 Ohms ± 5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		
	Current		35 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		
	Current		5 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		2B EHD Magnetic Blowout
	Rating		
	Material	N.O.	
		N.C.	Metal/Metal
	Dynamic Gap		
	Contact Gap		.125" Minimum
	Pressure	N.O.	
		N.C.	20 Grams Minimum
	Overtravel per Adjustment E		*See note #1 below
	Resistance	N.O.	
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.120" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

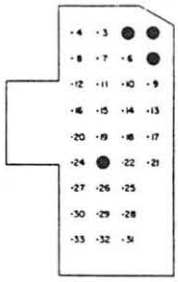
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-5-23

Notes

#1 N.C. Contacts to make with .113" and break with .106" between armature residual screw and core.

Test Procedure

Operating values of the 1225 ohm coil are listed above.
After obtaining values for the 1225 ohm coil, connect current supply of 10.5 amperes across the .068 ohm coil for 1½ minutes (Connect the DC positive (+) lead to relay terminal 3C and the DC negative (-) lead to relay terminal 3D). Relay must not pickup.
Immediately increase current to 11.25 amperes. Relay must pickup.

Field Requirements

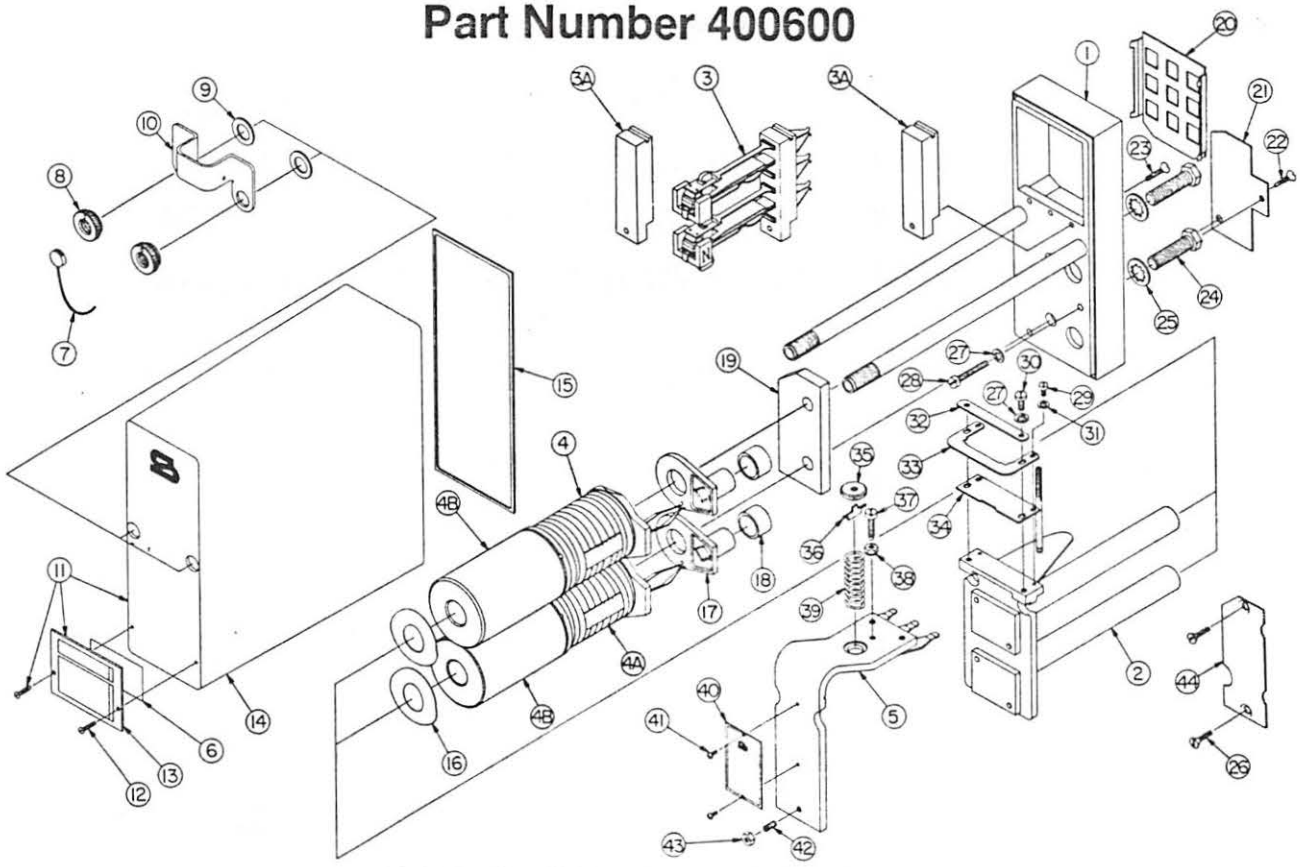
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400600

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400600



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2B Contact	1	420052-10X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	2	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 1225 Ohm	1	420051-1X				
4A	Coil Assembly, .068 Ohm	1	420051-12X	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	2	420051-2	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	2	420051	39	Spring, Compression	1	420053-43
18	Seal, Rubber	2	420051-1	40	Nameplate, Type ST Relay	1	420053-38
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-28	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-58
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-29
Revised 6/83

Safetran Systems Corporation

Part Number **400601**

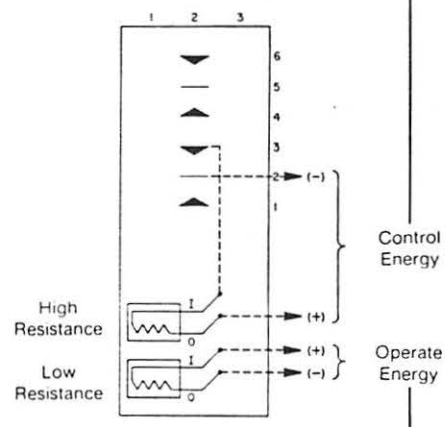
Specification for Type ST Plug-in Relay Neutral Relay, Switch Overload 2CBO Contacts, .064/135 Ohm Overload Rating 18 Amps, Low Voltage Machine

AC2-032

Characteristic			Original Requirements
Coils	Nominal V or I		Special - See Ratings
	Resistance/Tolerance		.064/135 Ohms ± 5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		
	Current		65 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		
	Current		20 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		2CBO (Close Before Open)
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Contact Gap	N.O.	.030" Minimum
		N.C.	.025" Minimum
	Pressure	N.O.	50 Grams Minimum
		N.C.	28 Grams Minimum
	Overtravel per Adjustment D		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

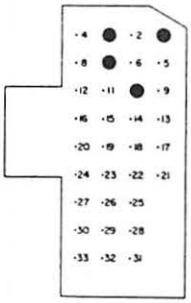
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-3-7-10

Notes

#1 N.O. Contacts to make with .056" and break with .061" between armature residual screw and core. N.C. Contacts to make with .027" and break with .022" between armature residual screw and core.

Test Procedure

Operating values of the 135 ohm coil are listed above.
After obtaining values for the 135 ohm coil, connect current supply of 14 amperes across the .064 ohm coil for 2 minutes (Connect the DC positive (+) lead to relay terminal 3C and the DC negative (-) lead to relay terminal 3D). Relay must not pickup.
Immediately increase current to 14.5 amperes. Relay must pickup.

Field Requirements

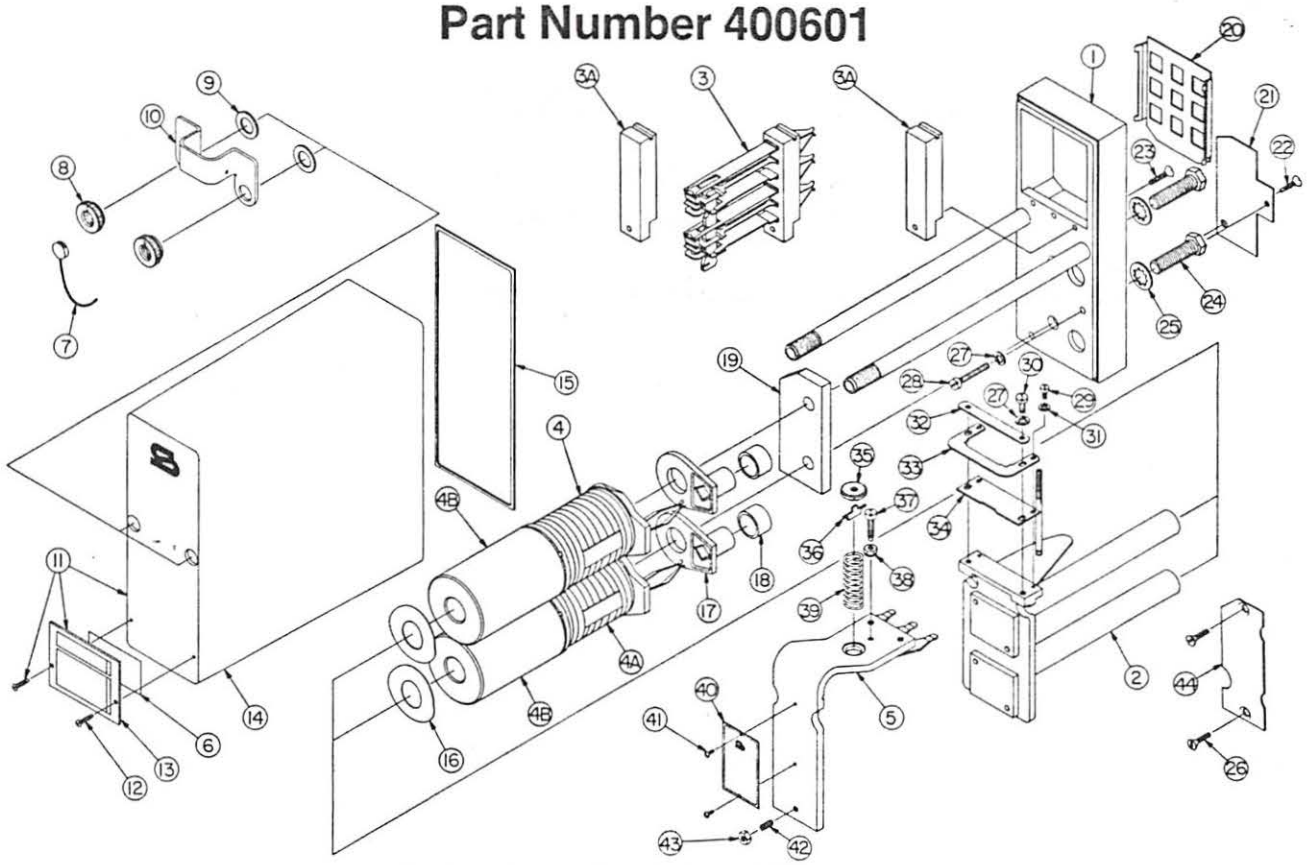
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400601

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400601



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2CBO Contact	1	420052-9X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	2	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 135 Ohm	1	420051-9X				
4A	Coil Assembly, .064 Ohm	1	420051-11X	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	2	420051-2	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	2	420051	39	Spring, Compression	1	420053-43
18	Seal, Rubber	2	420051-1	40	Nameplate, Type ST Relay	1	420053-39
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-29	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-59
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

I&M # 410000-30
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
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Safetran Systems Corporation

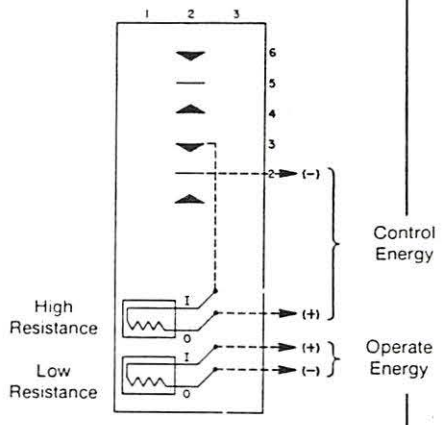
Part Number **400602**

Specification for Type ST Plug-in Relay Neutral Relay, Switch Overload 2CBO Contacts, .068/220 Ohm Overload Rating 11.5 Amps, High Voltage Machine

Characteristic			Original Requirements
Coils	Nominal V or I		Special - See Ratings
	Resistance/Tolerance		.068/220 Ohms ± 5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		
	Current		70 milliamps Maximum
	Speed	Pickup	
Dropaway	Voltage		
	Current		18 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		2CBO (Close Before Open)
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Contact Gap	N.O.	.030" Minimum
		N.C.	.025" Minimum
	Pressure	N.O.	50 Grams Minimum
		N.C.	28 Grams Minimum
	Overtravel per Adjustment D		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

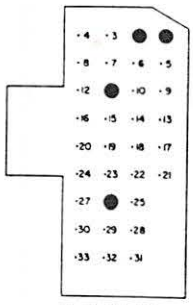
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-11-26

Notes

#1 N.O. Contacts to make with .056" and break with .061" between armature residual screw and core. N.C. Contacts to make with .027" and break with .022" between armature residual screw and core.

Test Procedure

Operating values of the 220 ohm coil are listed above.
After obtaining values for the 220 ohm coil, connect current supply of 10.5 amperes across the .068 ohm coil for 1½ minutes (Connect the DC positive (+) lead to relay terminal 3C and the DC negative (-) lead to relay terminal 3D). Relay must not pickup.
Immediately increase current to 11.25 amperes. Relay must pickup.

Field Requirements

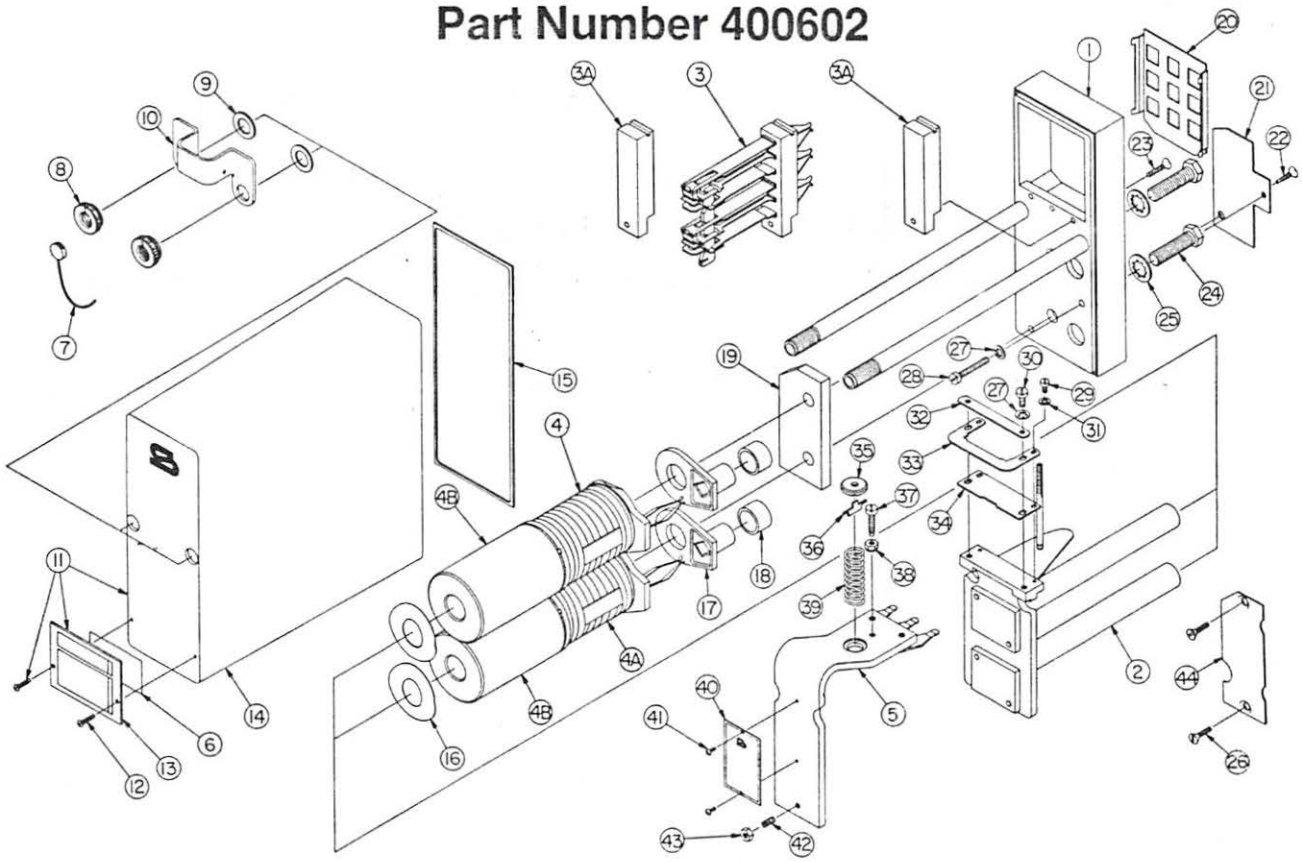
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400602

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400602



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2CBO Contact	1	420052-9X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	2	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 220 Ohm	1	420051-27X				
4A	Coil Assembly, .068 Ohm	1	420051-12X	27	Washer, Spring Lock, I, #8	3	420050-33
4B	Slug, Copper	2	420051-2	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
5	Armature	1	420053-1X				
6	Label, Paper Identification	1	420050-3	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	2	420051	39	Spring, Compression	1	420053-43
18	Seal, Rubber	2	420051-1	40	Nameplate, Type ST Relay	1	420053-55
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-102	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-502
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				

I&M # 410000-43
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems

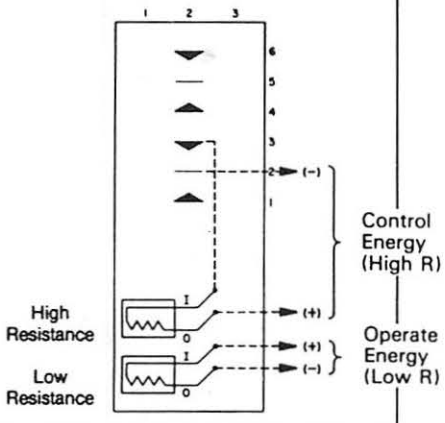
Part Number **400605**

Specification for Type ST Plug-in Relay Neutral Relay, Switch Overload 2CBO Contacts, .064/135 Ohm Overload Rating 12 Amps, High Voltage Machine

Characteristic			Original Requirements
Coils	Nominal V or I		Special-See Ratings
	Resistance/Tolerance		.064/135 Ohms ±5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		5.40 Volts Maximum (Control Coil)
	Current (See Notes Below)		40 milliamps Maximum, 135 Ohm Coil
	Speed	Pickup	Regular
Dropaway	Voltage		1.35 Volts Minimum
	Current		10 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		2CBO (Close Before Open)
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Contact Gap	N.O.	.030" Minimum
		N.C.	.025" Minimum
	Pressure	N.O.	50 Grams Minimum
		N.C.	28 Grams Minimum
	Overtravel per Adjustment D		*See Note #1 Below
	Resistance	N.O.	90 milliohms Maximum @10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @10 VDC, 1.0 Amps
Armature Travel			.082" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

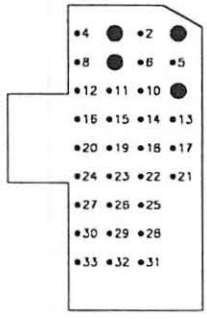
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-3-7-9

Notes

#1 N.O. Contacts to make with .056" and break with .061" between armature residual screw and core. N.C. Contacts to make with .027" and break with .022" between armature residual screw and core.

Test Procedure

Operating values of the 135 ohm coil are listed above.
After obtaining values for the 135 ohm coil, connect current supply of 10.5 amperes across the .064 ohm coil for 1-1/2 minutes (Connect the DC positive (+) lead to relay terminal 3C and the DC negative (-) lead to relay terminal 3D).
Relay must not pickup.
Immediately increase current to 12 amperes. Relay must pickup.

Field Requirements

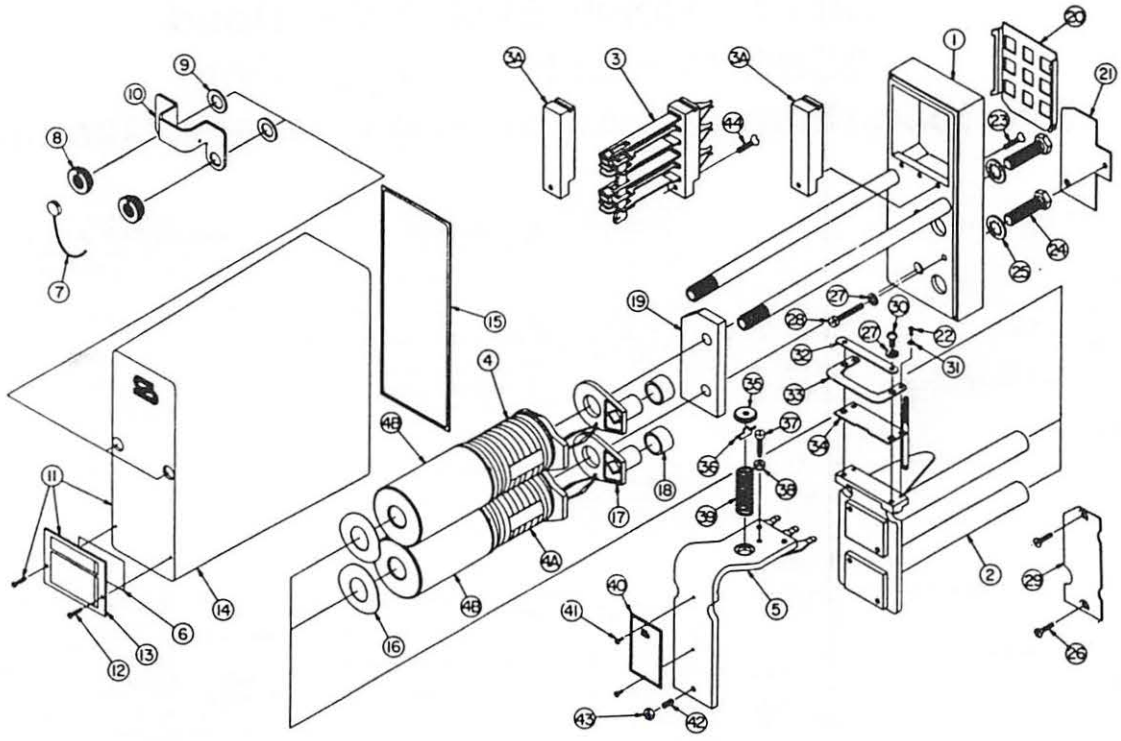
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400605

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400605



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly, Plug-In Relay	1	420050-X
2	Frame Assembly, Coil	1	420053-X
3	Stack, 2CBO Contact	1	420052-9X
3A	Stack, Blank Contact	2	420052-3
4	Coil Assembly, 135 Ohm	1	420051-9X
4A	Coil Assembly, .064 Ohm	1	420051-11X
4B	Slug, Copper	2	420051-2
5	Armature	1	420053-1X
6	Label, Paper Identification	1	420050-3
7	Seal, Lead	1	420050-8
8	Nut, Knurl Locking	2	420050-5
9	Washer, Flat Rubber	2	420050-7
10	Bracket, Cover	1	420050-4
11	Cover Assembly	1	420050-2X
12	Tap Screw, Round Head, #4 x .375"	2	420050-35
13	Cover, Nameplate	1	420050-2
14	Molded Cover, Clear	1	420050
15	Gasket, Cover	1	420050-1
16	Washer, Spring	2	420053-7
17	Insulator, Terminal Retainer	2	420051
18	Seal, Rubber	2	420051-1
19	Plate, Base	1	420053
20	Seal, Dust	1	420052
21	Plate, Code	1	420050-548
22	Machine Screw, Fillister Head, #4-40 x .250"	2	420053-14
23	Machine Screw, Flat Head, #6-32 x .375"	2	420052-2
24	Machine Screw, Hex Head, 5/16"-24 x 1.125"	2	420053-12
25	Washer, Spring, Lock, I, 5/16"	2	420053-13
26	Machine Screw, Flat Head, #6-32 x .5"	2	420050-36
27	Washer, Spring Lock, I, #8	3	420050-33
28	Machine Screw, Fillister Head, #8-32 x .937"	1	420050-32
29	Plate, Code Pin	1	420050-78
30	Machine Screw, Pan Head, #8-32 X .375"	2	420053-16
31	Washer, Spring Lock, I, #4	2	420053-15
32	Plate, Retainer	1	420053-3
33	Retainer, Armature	1	420053-2
34	Plate, Hinge	1	420053-1
35	Nut, Spring Post	1	420053-6
36	Key, Spring Retainer	1	420053-5
37	Screw, Tailstop	1	420053-9
38	Nut, Tailstop	1	420053-8
39	Spring, Compression	1	420053-43
40	Nameplate, Type ST Relay	1	420053-112
41	Phillips Screw, Pan Head, #4-40 X .187"	2	420053-18
42	Screw, Residual	1	420053-11
43	Nut, Residual	1	420053-10
44	Machine Screw, Flat Head, #6-32 X .531"	1	420050-36

Safetran Systems Corporation
4650 Main Street N.E.
Minneapolis, MN 55421
612/572-0466

I&M # 410000-104
Revised 2/95

Safetran Systems Corporation

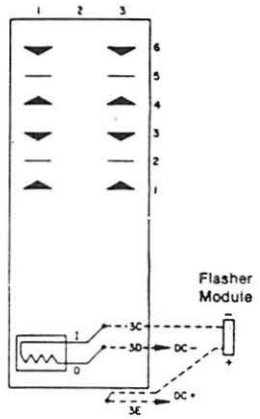
Part Number **400700**

Specification for Type ST Plug-in Relay
Neutral Relay, Flasher
4FB Contacts, 60 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		8-16 VDC w/Flasher Module
	Resistance/Tolerance		60 Ohms ± 5% (Single Coil)
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		4.2 Volts Maximum w/o Flasher Module
	Current		70 mA Maximum w/o Flasher Module
	Speed	Pickup	Regular
Dropaway	Voltage		1.86 Volts Minimum w/o Flasher Module
	Current		31 mA Minimum w/o Flasher Module
	Speed	Release	Regular
Contacts	Arrangement		4FB
	Rating		10 Amps/12 Volts
	Material	N.O.	Metal/Metal
		N.C.	Metal/Metal
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maxtmum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

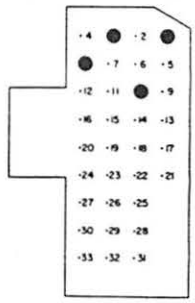
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-3-8-10

An external Flasher Unit Assembly, Part Number 400700-1X, provides a flash rate of 40-45 flashes per minute.

Part Number 400700-X includes Flasher Relay, Part Number 400700, and Flasher Module, Part Number 400700-1X.

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

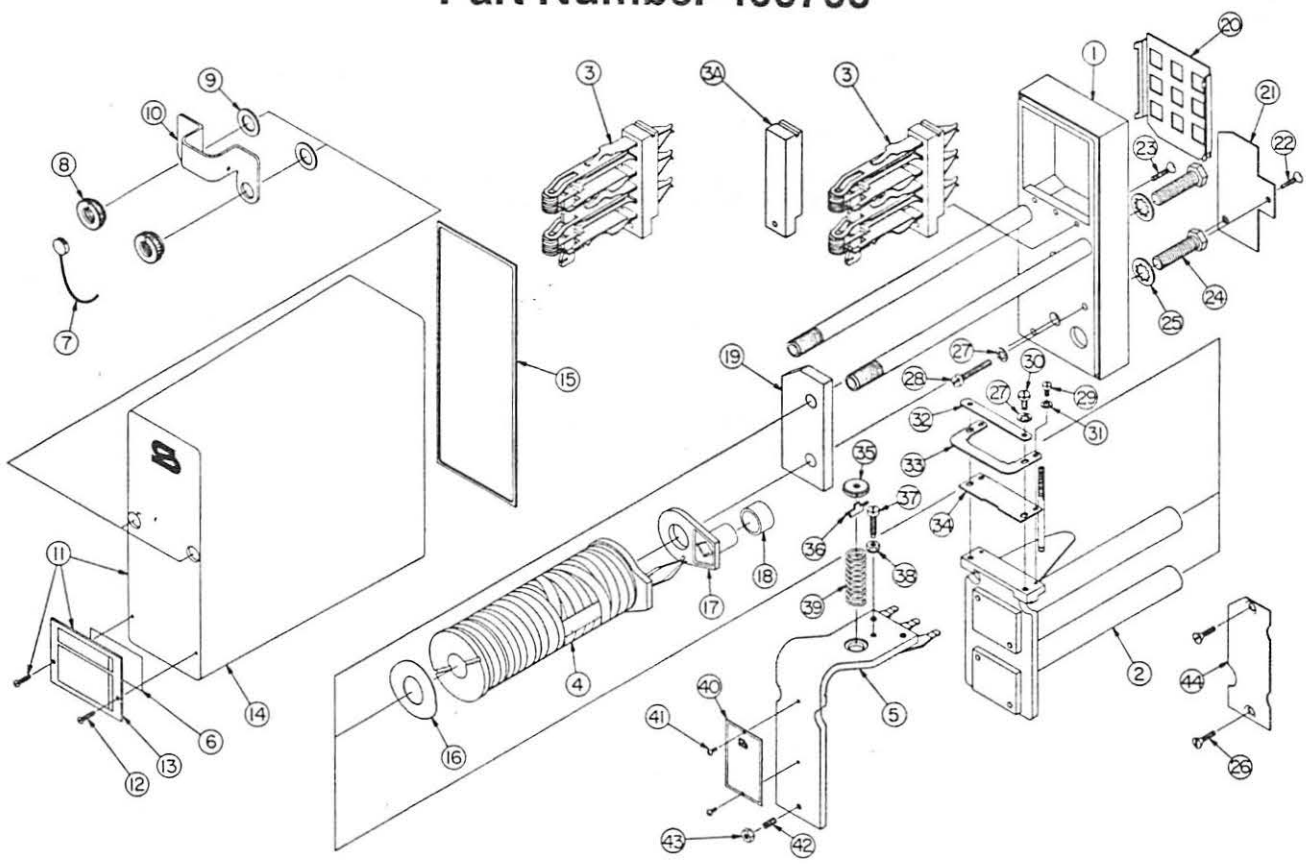
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400700

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400700



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-1X	24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12
2	Frame Assembly, Coil	1	420053-X				
3	Stack, 2FB Contact	2	420052-4X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
3A	Stack, Blank Contact	1	420052-3	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
4	Coil Assembly, 60 Ohm	1	420051-13X				
5	Armature	1	420053-1X	27	Washer, Spring Lock, I, #8	3	420050-33
6	Label, Paper Identification	1	420050-3	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
7	Seal, Lead	1	420050-8				
8	Nut, Knurl, Locking	2	420050-5	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
11	Cover Assembly	1	420050-2X				
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	31	Washer, Spring Lock, I, #4	2	420053-15
				32	Plate, Retainer	1	420053-3
13	Cover, Nameplate	1	420050-2	33	Retainer, Armature	1	420053-2
14	Molded Cover, Clear	1	420050	34	Plate, Hinge	1	420053-1
15	Gasket, Cover	1	420050-1	35	Nut, Spring Post	1	420053-6
16	Washer, Spring	1	420053-7	36	Key, Spring Retainer	1	420053-5
17	Insulator, Terminal Retainer	1	420051	37	Screw, Tailstop	1	420053-9
18	Seal, Rubber	1	420051-1	38	Nut, Tailstop	1	420053-8
19	Plate, Base	1	420053	39	Spring, Compression	1	420053-4
20	Seal, Dust	1	420052	40	Nameplate, Type ST Relay	1	420053-40
21	Plate, Code	1	420050-30	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34				
				42	Screw, Residual	1	420053-11
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	43	Nut, Residual	1	420053-10
				44	Plate, Code Pin	1	420050-60

I&M # 410000-31
Revised 6/83

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

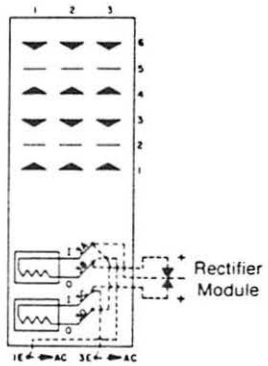
Part Number **400800**

Specification for Type ST Plug-in Relay
Neutral Relay, Power Transfer
6FB HD Contacts, 100/100 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		12 VAC w/Rectifier
	Resistance/Tolerance		100/100 Ohms ± 5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		8.3 Volts AC Maximum w/Rectifier
	Speed	Pickup	Regular
Dropaway	Voltage		6.3 Volts AC Minimum w/Rectifier
	Speed	Release	Regular
Contacts	Arrangement		6FB HD
	Rating		15 Amps/15 Volts
	Material	N.O.	Silver/Silver
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

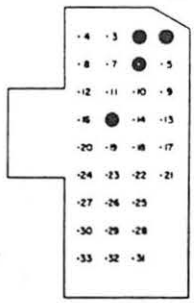
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-6-15

An external Rectifier Stack Assembly, Part Number 400800-1X, must be used with relay.

Part Number 400800-X includes Power Transfer Relay, Part Number 400800, and Rectifier Unit, Part Number 400800-1X.

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

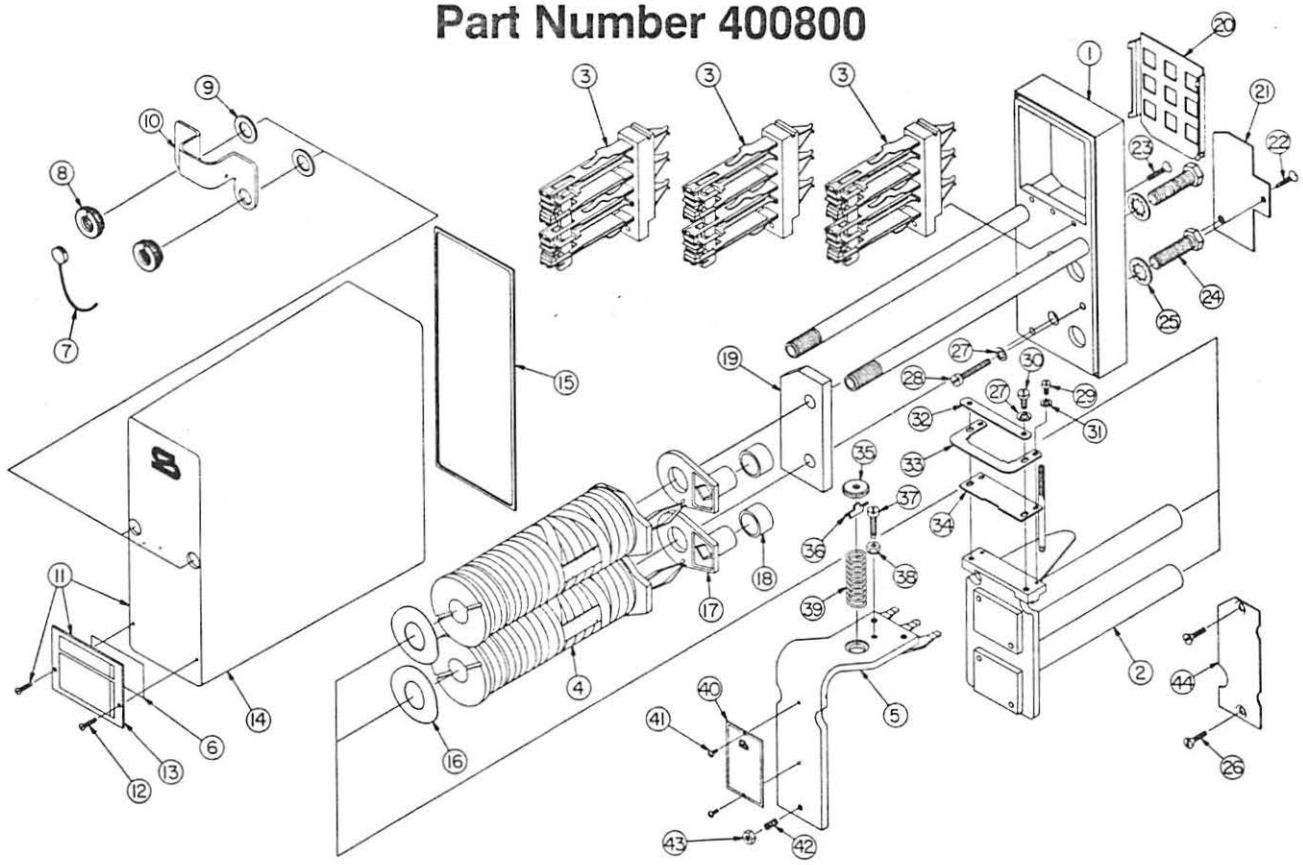
Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Rectifier Module

Part Number 400800

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400800



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
3	Stack, 2FB HD Contact	3	420052-3X				
4	Coil Assembly, 100 Ohm	2	420051-3X	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-7	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-43
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-41
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-31				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-61
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12				

I&M # 410000-32
Revised 8/85

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

Safetran Systems Corporation

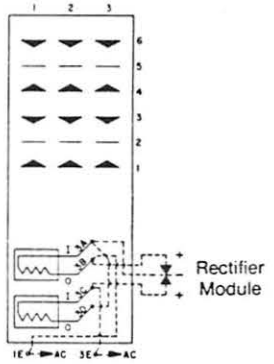
Part Number **400801**

Specification for Type ST Plug-in Relay
Neutral Relay, Power Transfer
6FB HD Contacts, 100/100 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10 VAC w/Rectifier
	Resistance/Tolerance		100/100 Ohms ± 5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		8.3 Volts AC Maximum w/Rectifier
	Speed	Pickup	Regular
Dropaway	Voltage		6.3 Volts AC Minimum w/Rectifier
	Speed	Release	Regular
Contacts	Arrangement		6FB HD
	Rating		20 Amps/15 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Carbon
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

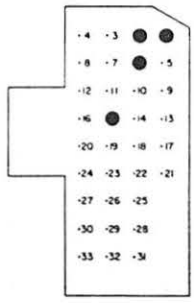
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-6-15

An external Rectifier Stack Assembly, Part Number 400801-1X, must be used with relay.

Part Number 400801-X includes Power Transfer Relay, Part Number 400801, and Rectifier Unit, Part Number 400800-1X.

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

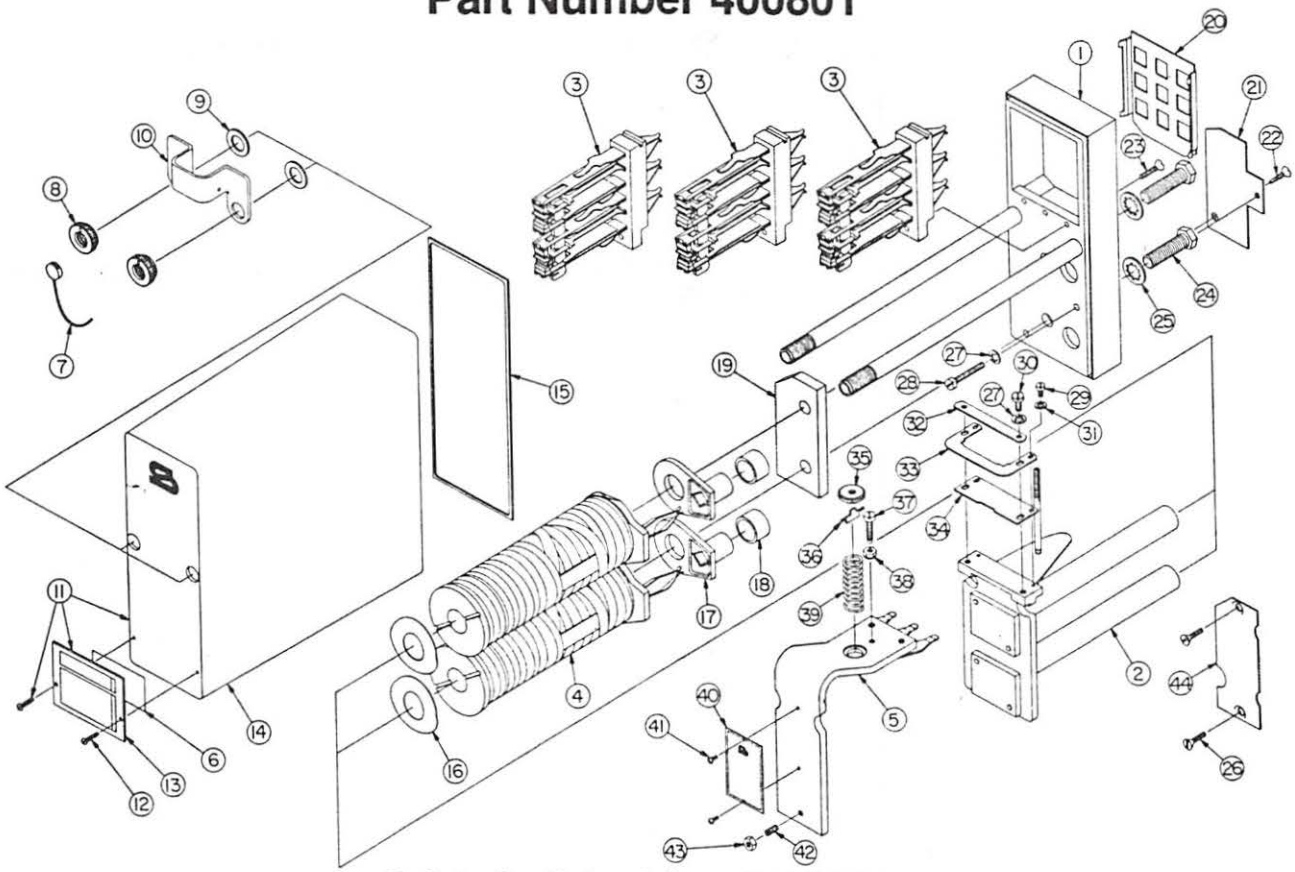
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400801

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400801



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
3	Stack, 2FB HD Contact	3	420052-13X				
4	Coil Assembly, 100 Ohm	2	420051-3X	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Machine Screw, Fillister Head, #4-40 X .25"	2	420053-14
8	Nut, Knurl, Locking	2	420050-5				
9	Washer, Flat Rubber	2	420050-7	30	Machine Screw, Fillister Head, #8-32 X .312"	2	420053-16
10	Bracket, Cover	1	420050-4				
11	Cover Assembly	1	420050-2X	31	Washer, Spring Lock, I, #4	2	420053-15
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	32	Plate, Retainer	1	420053-3
				33	Retainer, Armature	1	420053-2
13	Cover, Nameplate	1	420050-2	34	Plate, Hinge	1	420053-1
14	Molded Cover, Clear	1	420050	35	Nut, Spring Post	1	420053-6
15	Gasket, Cover	1	420050-1	36	Key, Spring Retainer	1	420053-5
16	Washer, Spring	2	420053-7	37	Screw, Tailstop	1	420053-9
17	Insulator, Terminal Retainer	2	420051	38	Nut, Tailstop	1	420053-8
18	Seal, Rubber	2	420051-1	39	Spring, Compression	1	420053-43
19	Plate, Base	1	420053	40	Nameplate, Type ST Relay	1	420053-66
20	Seal, Dust	1	420052	41	Machine Screw, Pan Head, #4-40 X .187"	2	420053-18
21	Plate, Code	1	420050-515				
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	42	Screw, Residual	1	420053-11
				43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2	44	Plate, Code Pin	1	420050-61
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12				

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-44
Revised 8/85

Safetran Systems Corporation

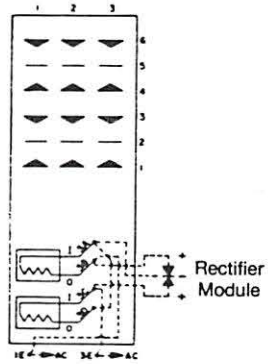
Part Number **400802**

Specification for Type ST Plug-in Relay
Neutral Relay, Power Transfer
6FB HD Contacts, 100/100 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		12 VAC w/Rectifier
	Resistance/Tolerance		100/100 Ohms ± 5%
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		9.9 Volts AC Maximum w/Rectifier
	Speed	Pickup	Regular
Dropaway	Voltage		7.6 Volts AC Minimum w/Rectifier
	Speed	Release	Regular
Contacts	Arrangement		6FB HD
	Rating		15 Amps/15 Volts
	Material	N.O.	Silver/Silver
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	21 Grams Minimum
	Overtravel per Adjustment A		*See note #1 below
	Resistance	N.O.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.087" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

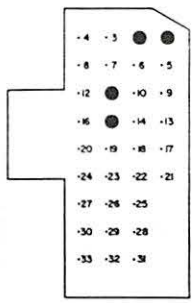
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



1-2-11-15

An external Rectifier Stack Assembly, Part Number 400800-1X, must be used with relay.

Part Number 400802-X includes Power Transfer Relay, Part Number 400802, and Rectifier Unit, Part Number 400800-1X.

Notes

#1 N.O. Contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Contacts to make with .066" and break with .059" between armature residual screw and core.

Field Requirements

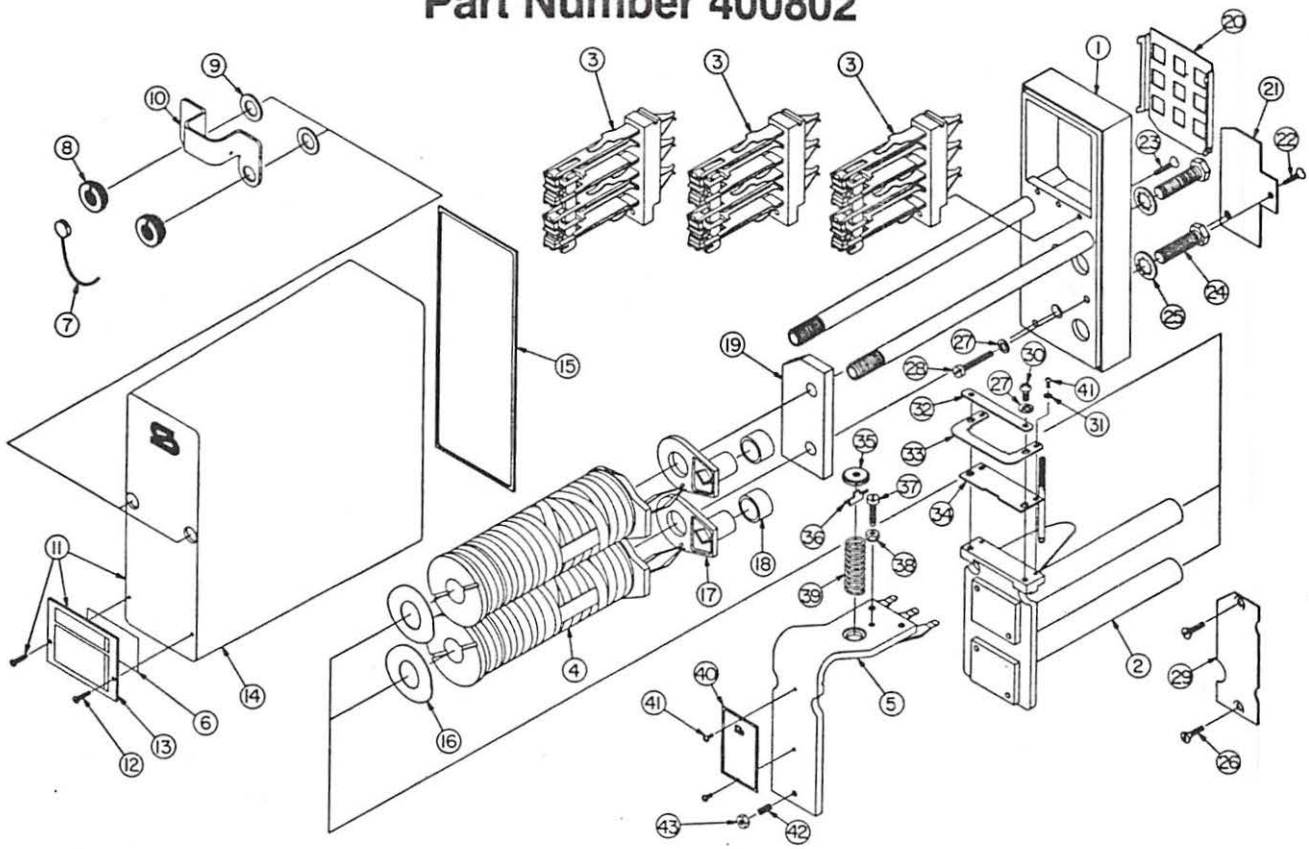
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 400802

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400802



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly, Plug-in Relay	1	420050-X	25	Washer, Spring Lock, I, 5/16"	2	420053-13
2	Frame Assembly, Coil	1	420053-X	26	Machine Screw, Flat Head, #6-32 X .5"	2	420050-36
3	Stack, 2FB HD Contact	3	420052-3X				
4	Coil Assembly, 100 Ohm	2	420051-3X	27	Washer, Spring Lock, I, #8	3	420050-33
5	Armature	1	420053-1X	28	Machine Screw, Fillister Head, #8-32 X .937"	1	420050-32
6	Label, Paper Identification	1	420050-3				
7	Seal, Lead	1	420050-8	29	Plate, Code Pin	1	420050-108
8	Nut, Knurl, Locking	2	420050-5	30	Machine Screw, Pan Head, #8-32 X .375"	2	420053-16
9	Washer, Flat Rubber	2	420050-7				
10	Bracket, Cover	1	420050-4	31	Washer, Spring Lock, I, #4	2	420053-15
11	Cover Assembly	1	420050-2X	32	Plate, Retainer	1	420053-3
12	Tap Screw, Round Head, #4 X .375"	2	420050-35	33	Retainer, Armature	1	420053-2
				34	Plate, Hinge	1	420053-1
13	Cover, Nameplate	1	420050-2	35	Nut, Spring Post	1	420053-6
14	Molded Cover, Clear	1	420050	36	Key, Spring Retainer	1	420053-5
15	Gasket, Cover	1	420050-1	37	Screw, Tailstop	1	420053-9
16	Washer, Spring	2	420053-7	38	Nut, Tailstop	1	420053-8
17	Insulator, Terminal Retainer	2	420051	39	Spring, Compression	1	420053-43
18	Seal, Rubber	2	420051-1	40	Nameplate, Type ST Relay	1	420053-70
19	Plate, Base	1	420053	41	Machine Screw, Pan Head, #4-40 X .187"	4	420053-18
20	Seal, Dust	1	420052				
21	Plate, Code	1	420050-520	42	Screw, Residual	1	420053-11
22	Tap Screw, Flat Head, #6-32 X .625"	1	420050-34	43	Nut, Residual	1	420053-10
23	Machine Screw, Flat Head, #6-32 X .375"	3	420052-2				
24	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12				

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-55
Revised 3/86

Safetran Systems

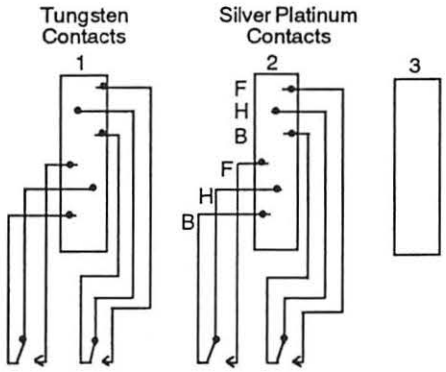
Part Number **400953**

Specification for Type ST Plug-in Relay
Code Responsive Relay
4FB Contacts, 80 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		40 Ohms ± 10% Each Coil
	Coils in Series		
Working Current			36 Milliamps Maximum
Pick-Up Current (Sat. -.102 - .116A)			25.5-29 Milliamps
Drop Away Current			10.5 Milliamps Minimum*
Contacts	Arrangement		4 FB
	Rating		Tungsten - Over 30 Volts Platinum - 30 Volts or Less
	Material		2 FB Tungsten 2 FB Silver Platinum
	Dynamic Gap		.10" Minimum
	Contact Gap		.040" Minimum
	Pressure	N.O.	50-70 Grams
		N.O.	50-70 Grams
	Overtravel		.020" Minimum - .023" Maximum
	Resistance	N.O.	1.0 Ohm
		N.O.	1.0 Ohm
Retainer Gap			.001"-.003"
Residual Gap Fixed			.000" - .001"
Residual Gap Adjustable		Front	.010" Minimum
		Back	.005" Minimum
Armature Air Gap Center			.007" Minimum
Build and Test			Per Adjustment "1"

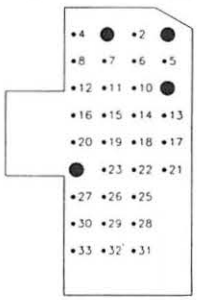
Contact & Terminal Arrangement

(Front of Relay)



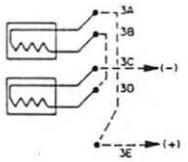
Relay Register

(Rear of Relay)



1-3-9-24

Coil



* At 10.5 Milliamps, N.O. Contacts must make and Armature must seat at 3 Milliamps

Field Requirements

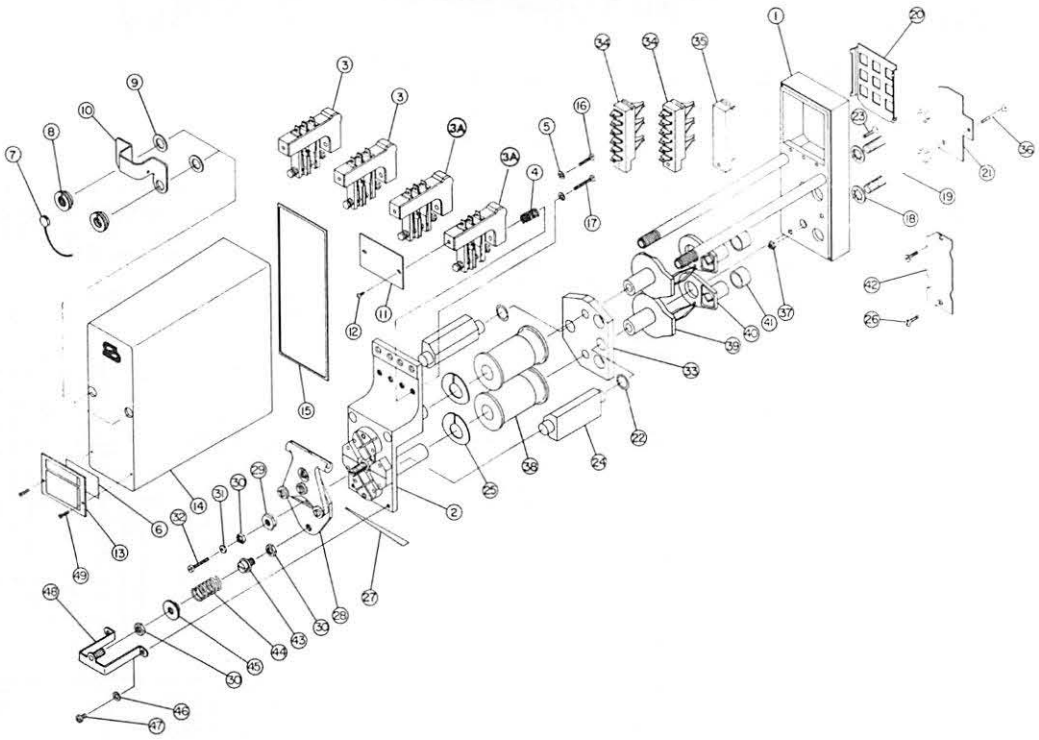
Drop Away Value- Not less than 70 % of original marking.
Pickup/Working Value- Not greater than 110% of original marking

Shop Requirements

Drop Away Value- Not less than 95% of original marking.
Pickup/Working Value- Not greater than 105% of original marking.

Part Number 400953

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400953



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number	Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly	1	420050-4X	26	Machine Screw, Flat Head, #6 - 32 x .5"	2	420050-36
2	Frame Assy. w/Cores & Pole PCS	1	420053-18X				
3	Contact Stack-Tungsten	2	420052-20X	27	Plate, Hinge	1	420050-125
3A	Contact Stack-Sil/Plat.	2	420052-19X	28	Armature Assembly	1	420054-23
4	Spring, Compression	4	420053-114	29	Nut, Hex, #1/4 - 40 x .500"	1	420053-127
5	Lock Washer	8	420053-115	30	Nut, Hex #1/4 - 40 x .312"	3	420053-128
6	Label, Paper Identification	1	420050-3	31	Nut, Hex, #6 - 32 x .250"	1	420053-129
7	Seal, Lead	1	420050-8	32	Screw, #6 -32 x .750"	1	420053-130
8	Nut, Knurl Locking	2	420050-5	33	Plate, Base	1	420053-131
9	Washer, Flat Rubber	2	420050-7	34	Terminal Sprip	2	420053-132
10	Bracket, Cover	1	420050-4	35	Stack, Blank	1	420052-3
11	Name Plate	1	420053-145	36	Screw, Flat Head #8 - 32 x 1.185"	1	420053-88
12	Phillips Screw, Pan Head, #4-40 X .187"	2	420053-18	37	Nut, Hex, #8 - 32 x .345"	1	420053-8
13	Cover, Nameplate	1	420050-2	38	Coil, 40 OHM	2	420051-58X
14	Molded Cover, Clear	1	420050	39	Bobbin & Terminal Assembly	2	420053-143
15	Gasket, Cover	1	420050-1	40	Insulator, Terminal Retainer	2	420051
16	Screw, #6 -40 x .562"	4	420053-118	41	Seal, Rubber	2	420051-1
17	Screw, #6-40 x .812"	4	420053-119	42	Code Pin Plate 1-3-9-24	1	420050-132
18	Lock Washer, 5/16"	2	420053-13	43	Residual Screw, #1/4-40 x .504"	1	420053-139
19	Bolt, 5/16 - 24" x 2.75" Long	2	420053-120	44	Compression Spring	1	420054-22
20	Seal, Dust	1	420052	45	Nut, Knurl, 1/4-40" RD	1	420053-141
21	Code Plate	1	420050-541	46	Washer, Int	1	420054-11
22	Washer, .450 x .064" Dia.	2	420053-122	47	Screw, Fil. Hd., #8-32 x .312"	1	420053-142
23	Machine Screw, Flat Head, #6-32 X .531"	3	420050-36	48	Bracket Assembly	1	420053-140
24	Magnet, Alnico	2	420053-123	49	Tap Screw, Round Head #4 x .375"	2	420050-35
25	Washer, Spring	2	420053-124				

Safetran Systems Corporation
4650 Main Street. N.E.
Minneapolis, Minnesota 55421
(612) 586-3202

I&M # 410000-89
Revised 11/95

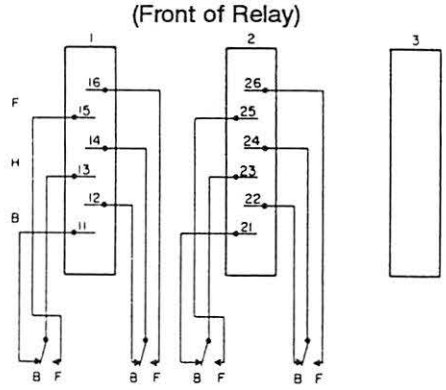
Safetran Systems

Part Number **400954**

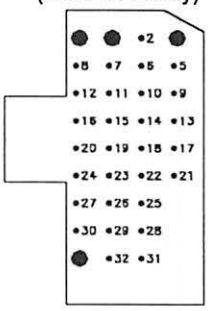
Specification for Type ST Plug-in Relay
Code Responsive Relay
4FB Contacts, 80 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		40 Ohms ± 10% Each Coil
	Coils in Series		
Working Current			63 Milliamps Maximum
Pick-Up Current			43-53 Milliamps
Drop Away Current			19 Milliamps Minimum
Contacts	Arrangement		4 FB
	Rating		4 Amps/30 Volts
	Material		Silver Platinum
	Dynamic Gap		.10" - .015" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	50-70 Grams
		N.O.	50-70 Grams
	Overtravel		.020" Minimum - .023" Maximum
	Resistance	N.O.	1.0 Ohm
		N.O.	1.0 Ohm
Retainer Gap			.001"-.003"
Residual Gap Fixed			.000" - .001"
Residual Gap Adjustable		Front	.010" Minimum
		Back	.005" Minimum
Armature Air Gap Center			.007" Minimum
Build and Test			Per Adjustment "7"

Contact & Terminal Arrangement

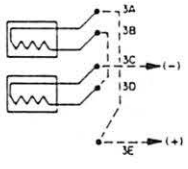


Relay Register



1-3-4-33

Coil



Field Requirements

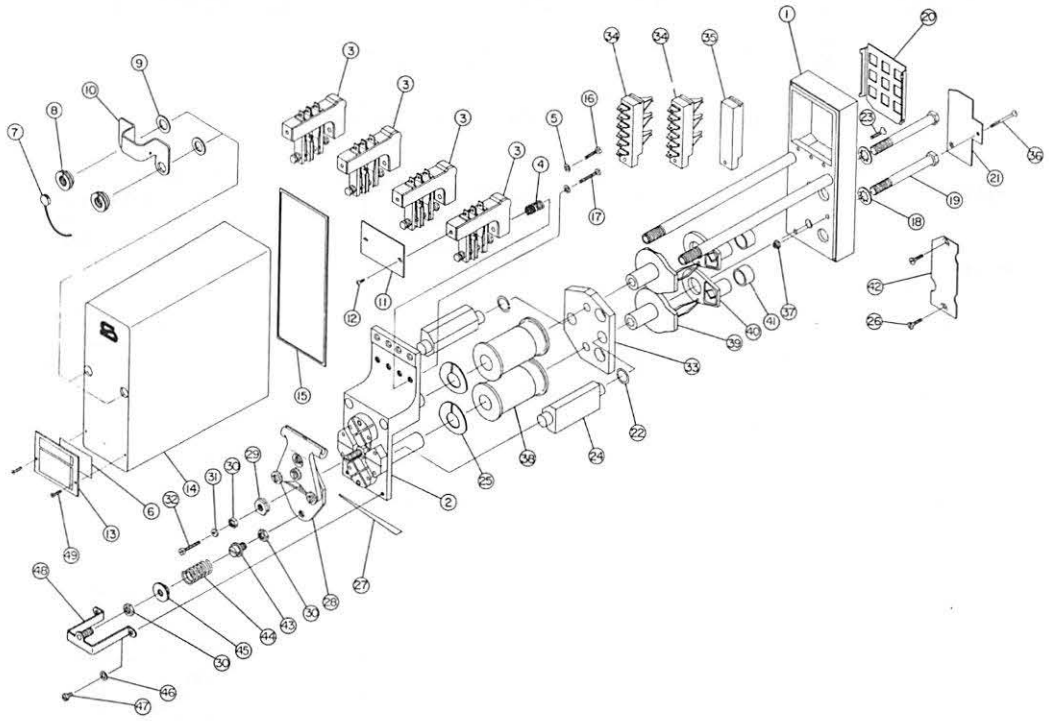
Drop Away Value- Not less than 70 % of original marking.
Pickup/Working Value- Not greater than 110% of original marking

Shop Requirements

Drop Away Value- Not less than 95% of original marking.
Pickup/Working Value- Not greater than 105% of original marking.

Part Number 400954

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400954



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number	Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly	1	420050-4X	26	Machine Screw, Flat Head, #6 - 32 x .5"	2	420050-36
2	Frame Assy. w/Cores & Pole PCS	1	420053-18X				
3	Contact Stack	4	420052-26X	27	Plate, Hinge	1	420050-125
4	Spring, Compression	4	420053-114	28	Armature Assembly	1	420054-23
5	Lock Washer	8	420053-115	29	Nut, Hex, #1/4 - 40 x .500"	1	420053-127
6	Label, Paper Identification	1	420050-3	30	Nut, Hex #1/4 - 40 x .312"	3	420053-128
7	Seal, Lead	1	420050-8	31	Nut, Hex, #6 - 32 x .250"	1	420053-129
8	Nut, Knurl Locking	2	420050-5	32	Screw, #6 -32 x .750"	1	420053-130
9	Washer, Flat Rubber	2	420050-7	33	Plate, Base	1	420053-131
10	Bracket, Cover	1	420050-4	34	Terminal Sprip	2	420053-132
11	Name Plate	1	420053-105	35	Stack, Blank	1	420052-3
12	Phillips Screw, Pan Head, #4-40 X .187"	2	420053-18	36	Screw, Flat Head #8 - 32 x 1.185"	1	420053-88
13	Cover, Nameplate	1	420050-2	37	Nut, Hex, #8 - 32 x .345"	1	420053-8
14	Molded Cover, Clear	1	420050	38	Coil, 40 OHM	2	420051-48X
15	Gasket, Cover	1	420050-1	39	Bobbin & Terminal Assembly	2	420053-143
16	Screw, #6 -40 x .562"	4	420053-118	40	Insulator, Terminal Retainer	2	420051
17	Screw, #6-40 x .812"	4	420053-119	41	Seal, Rubber	2	420051-1
18	Lock Washer, 5/16"	2	420053-13	42	Code Pin Plate 1-3-4-33	1	420050-135
19	Bolt, 5/16 - 24" x 2.75" Long	2	420053-120	43	Residual Screw, #1/4-40 x .504"	1	420053-139
20	Seal, Dust	1	420052	44	Compression Spring	1	420054-22
21	Code Plate	1	420050-551	45	Nut, Knurl, 1/4-40" RD	1	420053-141
22	Washer, .450 x .064" Dia.	2	420053-122	46	Washer, Int	1	420054-11
23	Machine Screw, Flat Head, #6-32 X .531"	3	420050-36	47	Screw, Fil. Hd., #8-32 x .312"	1	420053-142
				48	Bracket Assembly	1	420053-140
24	Magnet, Alnico	2	420053-123	49	Tap Screw, Round Head #4 x .375"	2	420050-35
25	Washer, Spring	2	420053-124				

Safetran Systems Corporation
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(612) 586-3202

I&M # 410000-106
Revised 11/95

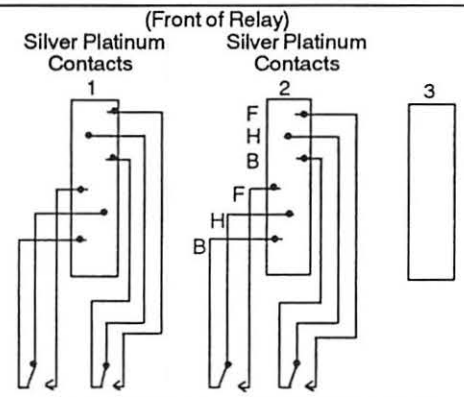
Safetran Systems

Part Number **400955**

Specification for Type ST Plug-in Relay
Code Responsive Relay
4FB Contacts, 80 Ohm

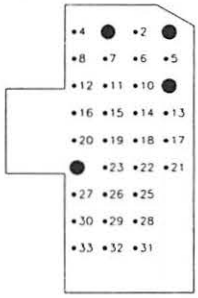
Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		40 Ohms ± 10% Each Coil
	Coils in Series		
Working Current			36 Milliamps Maximum
Pick-Up Current (Sat. -.102 - .116A)			25.5-29 Milliamps
Drop Away Current			10.5 Milliamps Minimum*
Contacts	Arrangement		4 FB
	Rating		Silver Platinum - 30 Volts or Less
	Material		4 FB Silver Platinum
	Dynamic Gap		.10" Minimum
	Contact Gap		.040" Minimum
	Pressure	N.O.	50-70 Grams
		N.O.	50-70 Grams
	Overtravel		.020" Minimum - .023" Maximum
	Resistance	N.O.	1.0 Ohm
		N.O.	1.0 Ohm
Retainer Gap			.001"-.003"
Residual Gap Fixed			.000" - .001"
Residual Gap Adjustable		Front	.010" Minimum
		Back	.005" Minimum
Armature Air Gap Center			.007" Minimum
Build and Test			Per Adjustment "1"

Contact & Terminal Arrangement



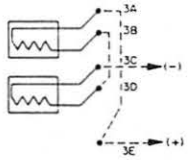
Relay Register

(Rear of Relay)



1-3-9-24

Coil



* At 10.5 Milliamps, N.O. Contacts must make and Armature must seat at 3 Milliamps

Field Requirements

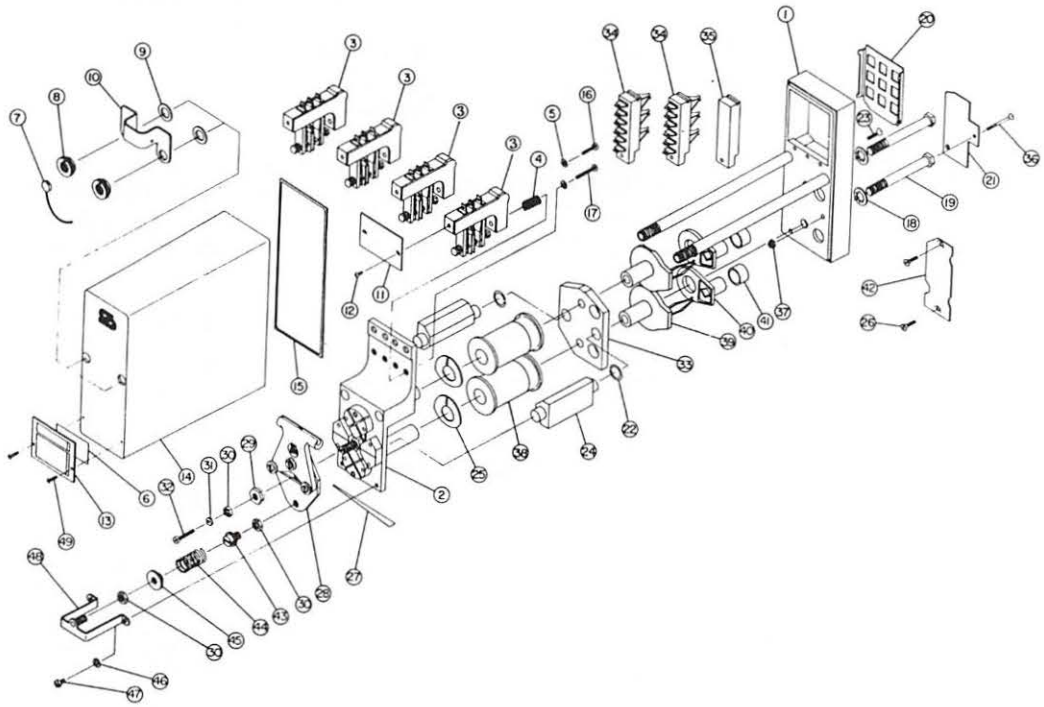
Drop Away Value- Not less than 70 % of original marking.
Pickup/Working Value- Not greater than 110% of original marking

Shop Requirements

Drop Away Value- Not less than 95% of original marking.
Pickup/Working Value- Not greater than 105% of original marking.

Part Number 400955

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 400955



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number	Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly	1	420050-4X	26	Machine Screw, Flat Head, #6 - 32 x .5"	2	420050-36
2	Frame Assy. w/Cores & Pole PCS	1	420053-18X				
3	Contact Stack-Sil/Plat.	4	420052-19X	27	Plate, Hinge	1	420050-125
4	Spring, Compression	4	420053-114	28	Armature Assembly	1	420054-23
5	Lock Washer	8	420053-115	29	Nut, Hex, #1/4 - 40 x .500"	1	420053-127
6	Label, Paper Identification	1	420050-3	30	Nut, Hex #1/4 - 40 x .312"	3	420053-128
7	Seal, Lead	1	420050-8	31	Nut, Hex, #6 - 32 x .250"	1	420053-129
8	Nut, Knurl Locking	2	420050-5	32	Screw, #6 -32 x .750"	1	420053-130
9	Washer, Flat Rubber	2	420050-7	33	Plate, Base	1	420053-131
10	Bracket, Cover	1	420050-4	34	Terminal Sprip	2	420053-132
11	Name Plate	1	420053-145	35	Stack, Blank	1	420052-3
12	Phillips Screw, Pan Head, #4-40 X .187"	2	420053-18	36	Screw, Flat Head #8 - 32 x 1.185"	1	420053-88
13	Cover, Nameplate	1	420050-2	37	Nut, Hex, #8 - 32 x .345"	1	420053-8
14	Molded Cover, Clear	1	420050	38	Coil, 40 OHM	2	420051-48X
15	Gasket, Cover	1	420050-1	39	Bobbin & Terminal Assembly	2	420053-143
16	Screw, #6 -40 x .562"	4	420053-118	40	Insulator, Terminal Retainer	2	420051
17	Screw, #6-40 x .812"	4	420053-119	41	Seal, Rubber	2	420051-1
18	Lock Washer, 5/16"	2	420053-13	42	Code Pin Plate 1-3-9-24	1	420050-132
19	Bolt, 5/16 - 24" x 2.75" Long	2	420053-120	43	Residual Screw, #1/4-40 x .504"	1	420053-139
20	Seal, Dust	1	420052	44	Compression Spring	1	420054-22
21	Code Plate	1	420050-541	45	Nut, Knurl, 1/4-40" RD	1	420053-141
22	Washer, .450 x .064" Dia.	2	420053-122	46	Washer, Int	1	420054-11
23	Machine Screw, Flat Head, #6-32 X .531"	3	420050-36	47	Screw, Fil. Hd., #8-32 x .312"	1	420053-142
				48	Bracket Assembly	1	420053-140
24	Magnet, Alnico	2	420053-123	49	Tap Screw, Round Head #4 x .375"	2	420050-35
25	Washer, Spring	2	420053-124				

Safetran Systems Corporation
4650 Main Street. N.E.
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(612)586-3202

I&M # 410000-108
New 11/95

HAWKER SIDDELEY
Safetran Systems

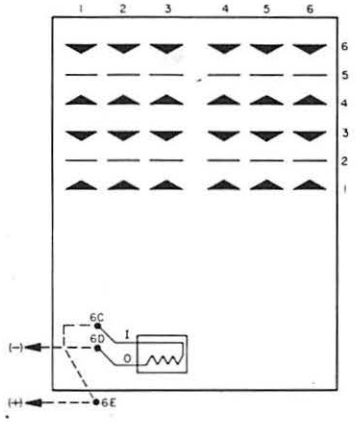
Part Number **450200**

Specification for Type ST Plug-in Relay
Neutral Relay, Slow Release
12FB Contacts, 260 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		260 Ohms ±5% (Single Coil)
Temperature Range			−40C (−40F) to 85C (185F)
P.U./W.C.	Voltage		6.01 Volts Maximum
	Current		23.1 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.96 Volts Minimum
	Current		11.4 milliamps Minimum
	Speed	Release	.825 — 1.1 Seconds @ 10 VDC
Contacts	Arrangement		12FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	14 Grams Minimum
	Overtravel Per Adjustment J		*See note #1 below
	Resistance	N.O.	90 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	30 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.056" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.005" Minimum
Stop Pin (Fixed)			.003" Minimum

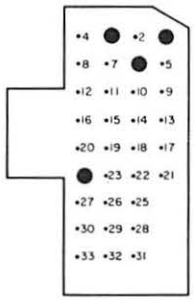
Contact/Coil Arrangement

(Front of Relay)



Relay Register

(Rear of Relay)



1-3-6-24

Notes

#1 N.O. Contacts to make with .017" and break with .024" between armature residual screw and core. N.C. Contacts to make with .044" and break with .038" between armature residual screw and core.

Field Requirements

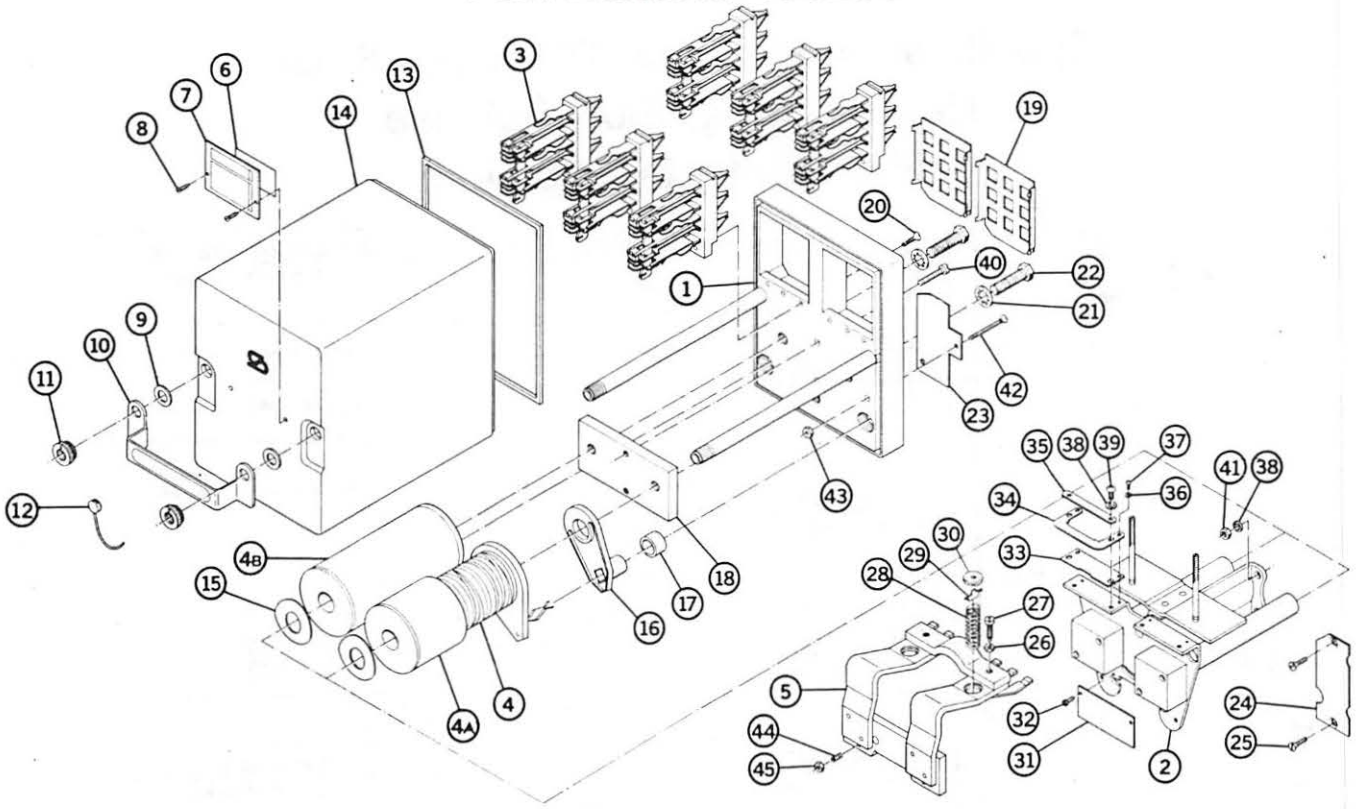
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 450200

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 450200



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly	1	420050-3X	25	Machine Screw, Flat Head, #6-32 X .531"	2	420050-36
2	Frame Assembly	1	420053-50X				
3	Stack, 2FB Contact	6	420052-1X	26	Nut, Tailstop	2	420053-8
4	Coil Assembly, 260 Ohm	1	420051-42X	27	Screw, Tailstop	2	420053-48
4A	Slug, Copper	1	420051-40	28	Spring, Compression	2	420053-92
4B	Slug, Copper	1	420051-41	29	Key, Spring Retaining	2	420053-5
5	Armature Assembly	1	420053-11X	30	Nut, Spring Post	2	420053-6
6	Label, Paper Identification	1	420050-65	31	Nameplate	1	420053-87
7	Cover, Nameplate	1	420050-2	32	Fillister Screw, Slotted, #4-40 X .250"	2	420053-14
8	Tap Screw, Round Head, #4 X .375"	2	420050-35				
				33	Plate, Hinge	2	420053-84
9	Washer, Flat Rubber	2	420050-7	34	Retainer, Armature	2	420053-83
10	Handle	1	420050-38	35	Plate, Retainer	2	420053-85
11	Nut, Knurl, Locking	2	420050-5	36	Washer, Spring Lock, I, #4	4	420053-15
12	Seal, Lead	1	420050-8	37	Machine Screw, Pan Head, #4-40 X .187"	4	420053-18
13	Gasket, Cover	1	420050-12				
14	Molded Cover, Clear	1	420050-37	38	Washer, Spring Lock, I, #8	6	420050-33
15	Washer, Spring	2	420053-7	39	Machine Screw, Pan Head, #8-32 X .375"	4	420053-16
16	Insulator, Terminal Retainer	1	420051-11				
17	Seal, Rubber	1	420051-1	40	Fillister Screw, #8-32 X .875"	2	420053-51
18	Plate, Base	1	420053-82	41	Square Nut, #8-32 X .312"	2	420053-72
19	Seal, Dust	2	420052	42	Screw, Flat Head, #8-32 X 1.185"	1	420053-88
20	Machine Screw, Flat Head, #6-32 X .531"	6	420050-36				
				43	Nut, Hex, #8-32 X .345"	1	420053-8
21	Washer, Spring Lock, 1-5/16"	2	420053-99	44	Screw, Residual	2	420053-71
22	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12	45	Nut, Residual	2	420053-81
23	Plate, Code	1	420053-93				
24	Plate, Code Pin	1	420050-119				

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-66
6/89

Safetran Systems

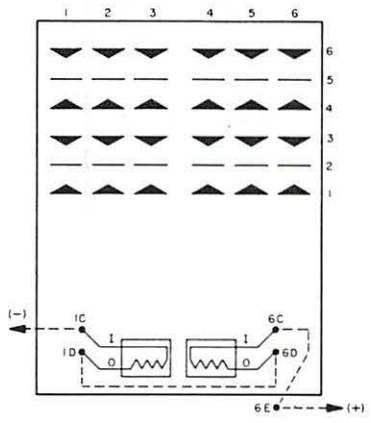
Part Number **450500**

Specification for Type ST Plug-in Relay
Biased Relay, Regular Release
12FB Contacts, 350 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		175 Ohms ±5% Each Coil
Temperature Range			−40C (−40F) to 85C (185F)
P.U./W.C.	Voltage		6.62 Volts Maximum
	Current		18.9 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.66 Volts Minimum
	Current		7.6 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		12FB
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	15 Grams Minimum
	Overtravel Per Adjustment I		*See note #1 below
	Resistance	N.O.	40 milliohms Maximum @ 10 VDC, 1.0 Amps
		N.C.	20 milliohms Maximum @ 10 VDC, 1.0 Amps
Armature Travel			.052" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

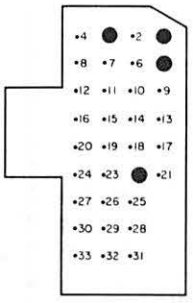
Contact/Coil Arrangement

(Front of Relay)



Relay Register

(Rear of Relay)



Notes

#1 N.O. Contacts to make with .017" and break with .022" between armature residual screw and core. N.C. Contacts to make with .041" and break with .036" between armature residual screw and core.

Field Requirements

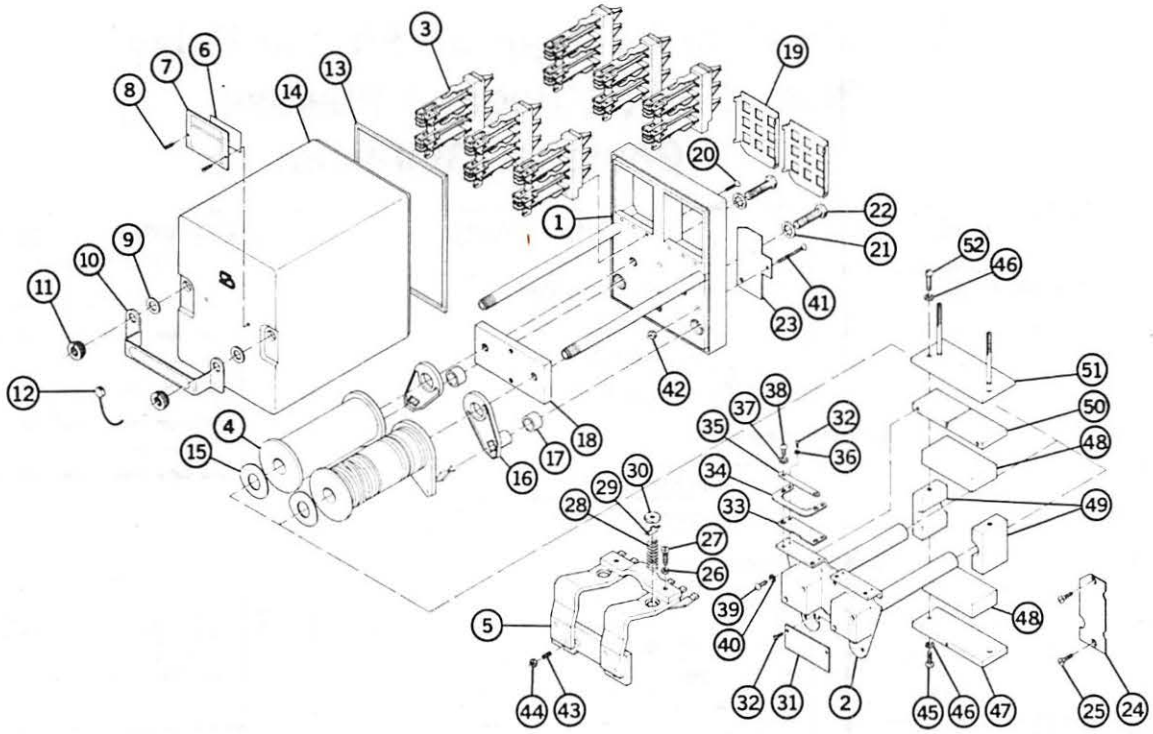
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 450500

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 450500



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Base Assembly	1	420050-73X	28	Spring, Compression	2	420053-92
2	Frame Assembly	1	420053-97X	29	Key, Spring Retaining	2	420053-5
3	Stack, 2FB Contact	6	420052-1X	30	Nut, Spring Post	2	420053-6
4	Coil Assembly, 175 Ohm	2	420051-43X	31	Nameplate	1	420053-98
5	Armature Assembly	1	420053-11X	32	Fillister Screw, Slotted, #4-40 X .250"	6	420053-14
6	Label, Paper Identification	1	420050-65				
7	Cover, Nameplate	1	420050-2	33	Plate, Hinge	2	420053-84
8	Tap Screw, Round Head, #4 X .375"	2	420050-35	34	Retainer, Armature	2	420053-83
				35	Plate, Retainer	2	420053-85
9	Washer, Flat Rubber	2	420050-7	36	Washer, Spring Lock, I, #4	4	420053-15
10	Handle	1	420050-38	37	Washer, Spring Lock, I, #8	4	420050-33
11	Nut, Knurl, Locking	2	420050-5	38	Machine Screw, Pan Head, #8-32 X .375"	4	420053-16
12	Seal, Lead	1	420050-8				
13	Gasket, Cover	1	420050-12	39	Fillister Screw, #8-32 X .375"	2	420053-70
14	Molded Cover, Clear	1	420050-37	40	Lockwasher, Int. Tooth, #8	2	420050-68
15	Washer, Spring	2	420053-7	41	Screw, Flat Head, #8-32 X 1.185"	1	420053-88
16	Insulator, Terminal Retainer	2	420051-11				
17	Seal, Rubber	2	420051-1	42	Nut, Hex, #8-32 X .345"	1	420053-8
18	Plate, Base	1	420053-82	43	Screw, Residual	2	420053-71
19	Seal, Dust	2	420052	44	Nut, Residual	2	420053-81
20	Machine Screw, Flat Head, #6-32 X .531"	6	420050-36	45	Screw, #10 × .500"	2	420050-74
				46	Lockwasher, Int. Tooth, #10	4	420050-69
21	Washer, Spring Lock, 1-5/16"	2	420053-99	47	Plate, Shunt	1	420053-96
22	Machine Screw, Hex Head, 5/16"-24 X 1.125"	2	420053-12	48	Magnet, Alnico	2	420053-90
				49	Plate, Shunt, Silicon	2	420053-91
23	Plate, Code	1	420053-94	50	Plate, Shunt, Top	1	420053-95
24	Plate, Code Pin	1	420050-116	51	Frame & Post Bracket Assembly	1	420050-66
25	Machine Screw, Flat Head, #6-32 X .531"	2	420050-36	52	Screw, #10 × .687"	2	420050-71
26	Nut, Tailstop	2	420053-8				
27	Screw, Tailstop	2	420053-48				

Safetran Systems Corporation
4650 Main Street, N.E.
Minneapolis, Minnesota 55421
612/572-0466

I&M # 410000-67
6/89

Safetran Systems

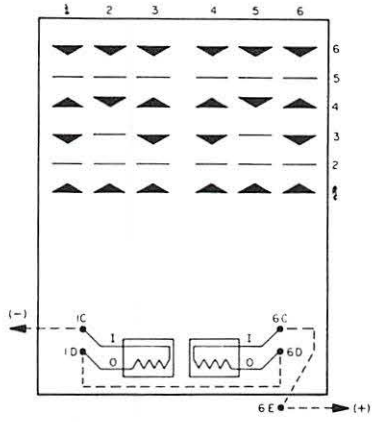
Part Number **450501**

Specification for Type ST Plug-in Relay
Biased Relay, Regular Release
8FB-4F-2B Contacts, 350 Ohm

Characteristic			Original Requirements
Coils	Nominal V or I		10-12 VDC
	Resistance/Tolerance		175 Ohms ±5% Each Coil
Temperature Range			-40C (-40F) to 85C (185F)
P.U./W.C.	Voltage		6.62 Volts Maximum
	Current		18.9 milliamps Maximum
	Speed	Pickup	Regular
Dropaway	Voltage		2.66 Volts Minimum
	Current		7.6 milliamps Minimum
	Speed	Release	Regular
Contacts	Arrangement		8FB-4F-2B
	Rating		4 Amps/30 Volts
	Material	N.O.	Silver/Carbon
		N.C.	Silver/Silver
	Dynamic Gap		.020" Minimum
	Contact Gap		.050" Minimum
	Pressure	N.O.	40 Grams Minimum
		N.C.	15 Grams Minimum
	Overtravel per Adjustment 1		*See Note #1 Below
	Resistance	N.O.	40 milliohms Maximum @10 VDC, 1.0 Amps
		N.C.	20 milliohms Maximum @10 VDC, 1.0 Amps
Armature Travel			.052" Minimum
Retainer Gap Reference			.002" to .004"
Residual Screw (Adjustable)			.010" Minimum
Stop Pin (Fixed)			.008" Minimum

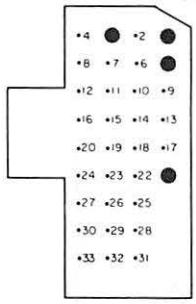
Contact/Coil Arrangement

(Front of Relay)



Relay register

(Rear of Relay)



Notes

#1 N.O. Contacts to make with .017" and break with .022" between armature residual screw and core. N.C. Contacts to make with .041" and break with .036" between armature residual screw and core.

Field Requirements

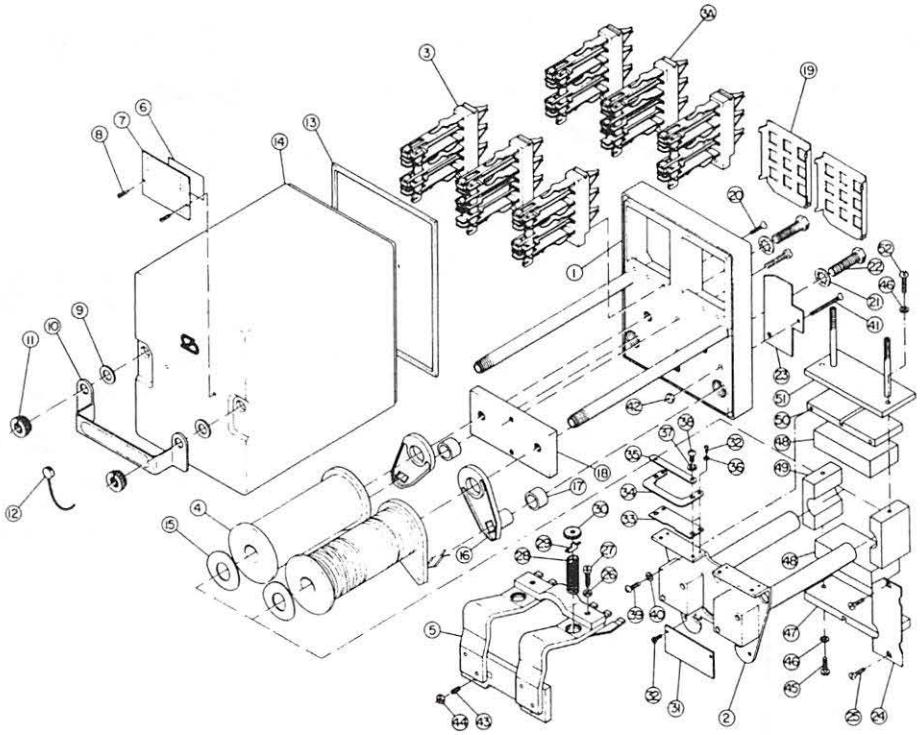
Drop Away Value — Not less than 70% of original marking.
Pickup/Working Value — Not greater than 110% of original marking.

Shop Requirements

Drop Away Value — Not less than 95% of original marking.
Pickup/Working Value — Not greater than 105% of original marking.

Part Number 450501

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 450501



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number	Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly	1	420050-73X	27	Screw, Tailstop	2	420053-48
2	Frame Assembly	1	420053-97X	28	Spring, Compression	2	420053-92
3	Stack, 2FB Contact	4	420052-1X	29	Key, Spring Retaining	2	420053-5
3A	Stack, 2F-1B Contact	2	420052-2X	30	Nut, Spring Post	2	420053-6
4	Coil Assembly, 175 Ohm	2	420051-43X	31	Nameplate	1	420053-73
5	Armature Assembly	1	420053-11X	32	Fillister Screw, Slotted, #4-40 x .250"	6	420053-14
6	Label, Paper Identification	1	420050-65	33	Plate, Hinge	2	420053-84
7	Cover, Nameplate	1	420050-2	34	Retainer, Armature	2	420053-83
8	Tap Screw, Round Head, #4 x .375"	2	420050-35	35	Plate, Retainer	2	420053-85
9	Washer, Flat Rubber	2	420050-7	36	Washer, Spring Lock, I, #4	4	420053-15
10	Handle	1	420050-38	37	Washer, Spring Lock, I, #8	4	420050-33
11	Nut, Knurl, Locking	2	420050-5	38	Machine Screw, Pan Head, #8-32 x .375"	4	420053-16
12	Seal, Lead	1	420050-8	39	Fillister Screw, #8-32 x .375"	2	420053-70
13	Gasket, Cover	1	420050-12	40	Lockwasher, Int. Tooth, #8	2	420053-68
14	Molded Cover, Clear	1	420050-37	41	Screw, Flat Head, #8-32 x 1.185"	1	420053-88
15	Washer, Spring	2	420053-7	42	Nut, Hex, #8-32 x .345"	1	420053-8
16	Insulator, Terminal Retainer	2	420051-11	43	Screw, Residual	2	420053-71
17	Seal, Rubber	2	420051-1	44	Nut, Residual	2	420053-81
18	Plate, Base	1	420053-82	45	Screw, #10 x .500"	2	420050-74
19	Seal, Dust	2	420052	46	Lockwasher, Int. Tooth, #10	4	420050-69
20	Machine Screw, Flat Head, #6-32 x .531"	6	420050-36	47	Plate, Shunt	1	420053-96
21	Washer, Spring Lock, 1-5/16"	2	420053-99	48	Magnet, Alnico	2	420053-90
22	Machine Screw, Fillister Head, 5/16"-24 x 1.125"	2	420053-12	49	Plate, Shunt, Silicon	2	420053-91
23	Plate, Code	1	420050-523	50	Plate, Shunt, Top	1	420053-95
24	Plate, Code Pin	1	420050-112	51	Frame & Post Bracket Assembly	1	420050-66
25	Machine Screw, Flat Head, #6-32 x .531"	2	420050-36	52	Screw, #10 x .687"	2	420050-71
26	Nut, Tailstop	2	420053-8				

Safetran Systems Corporation
4650 Main Street N.E.
Minneapolis, MN 55421
612-586-3202

I&M # 410000-56
Revised 11/95

Safetran Systems

Part Number **450992**

Specification for Type ST Plug-in Relay Vane Relay, Alternating Current, Two Position, Track Relay 4F-4B Contacts, 110/55 Local Winding Volts, 1.0/0.5 Track Winding Volts, 60 Hz Frequency

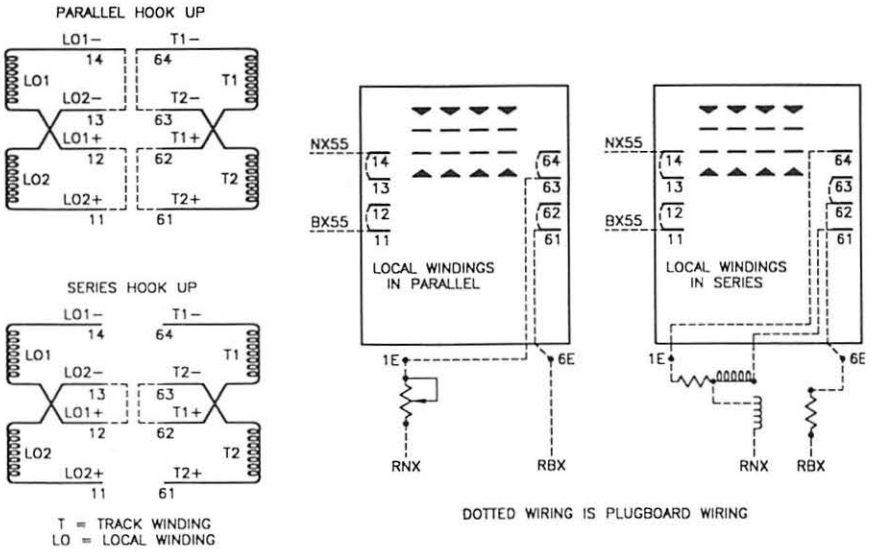
Coil Resistance/Tolerance:	144 Ohms +/- 10% (LOCAL), .524 Ohm +/-10% (TRACK)
Contact Arrangement:	4F-4B
Contact Material:	N.O. - Silver/Carbon N.C. & Movable - Silver
Contact Gap:	.050" to .055" (N.O.) .060" to .065" (N.C.)
Contact Pressure:	32-40 Grams Min. (N.O.) 25 Grams Min. (N.C.)
Contact Resistance Max:	40m Ohms Max at 10V 1.0A (N.O.) 20m Ohms Max at 10V 1.0A (N.C.)
Operate Time:	.2 Sec +/-10% (MAKE N.O.) at .484A, .142 Sec +/-10% at .484A (BREAK N.C.) at .484A
Vane Clearane:	.020" Min. Between Vane and Magnets
Vane Shaft and Play:	.003" to .005"
% DA Min:	75
DA Make N.C. Min:	.152A
DA Make Stop Min:	.066A
Pull-Up Max:	.231A
Work Max:	.326A
% Work Max:	160
Code Plate Register:	25 - 26 - 27 - 30

Notes

110V 60 Hz must be on local coil and current on track coil to obtain pull-up and drop-away.

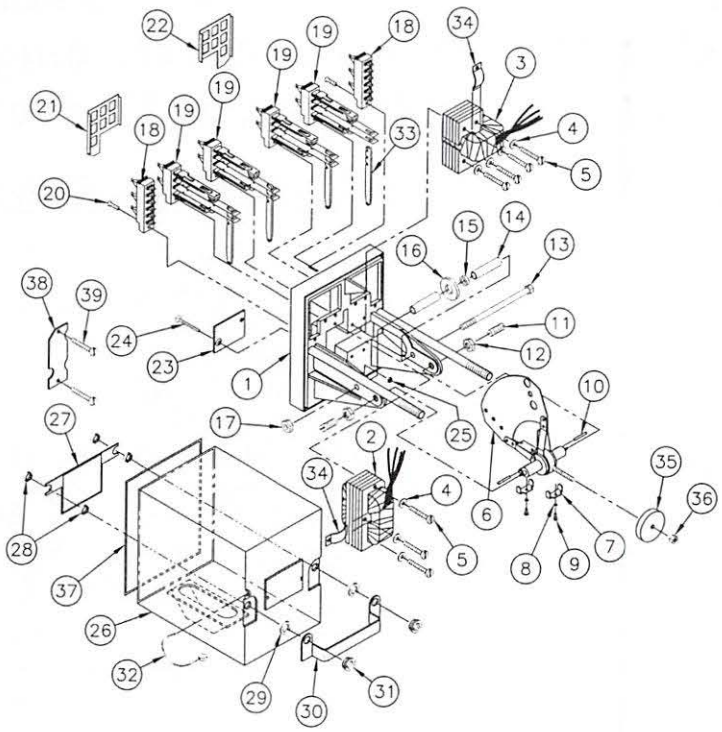
Raise vane from backstop by hand and release, vane must strike and hold tight against back stop.

Relay tested with windings in series at 60 Hz.



Part Number 450992

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 450992



To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd	Part No.	Item No.	Description	Qty. Req'd	Part No.
1	Base Assembly	1	420054-47	21	Dust Plate, L	1	420054-31
2	Coil, Local	1	420051-56X	22	Dust Plate, R	1	420054-32
3	Coil, Track	1	420051-60X	23	Code Plate	1	420054-64
4	#8 Lock Washer	7	420054-56	24	Screw, #8-32 x 1.185"	1	420053-88
5	#8-32 Screw	7	420054-57	25	Nut, Hex #8-32 x .345"	1	420053-8
6	Vane & Shaft Assembly	1	420054-43	26	Clear Cover	1	420054-44
7	Clip, Pin Pusher	2	420054-58	27	Name Plate	1	420054-66
8	Lock Washer, #4, Clip	2	420053-15	28	Nut, 3/4-32 RD	2	420054-54
9	Screw, #4-40 x .250"	2	420053-14	29	Washer, Flat Rubber	2	420050-7
10	Pin, Operating Pusher	2	420054-49	30	Handle	1	420050-38
11	Bearing, Shaft	2	420054-39	31	Nut, Knurl, Locking	2	420050-5
12	Nut, Bearing	2	420054-55	32	Seal, Lead	1	420050-8
13	Bolt 1/4-28" x 4.125"	1	420054-46	33	Pusher	4	420054-38
14	Spacer	2	420054-50	34	Spring, Coil	2	420054-53
15	Stop Spacer	2	420054-52	35	Vane Weight	1	420054-33
16	Vane Stop	1	420054-51	36	Nut, #10-32 x .375" Hex	1	420054-21
17	Nut, 1/4-28 Hex	2	420000-66	37	Gasket, Cover	1	420050-12
18	Terminal Strip	2	420053-132	38	Plate, Code Pin	1	420054-61
19	Contact Stack Assembly	4	420052-28X	39	Screw, #6 - 32 x .5"	2	420050-36
20	Machine Screw	2	420050-36				

Safetran Systems Corporation
4650 Main Street. N.E.
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612-586-3202

I&M # 410000-189
New 11/95

Safetran Systems

Part Number **450993**

Specification for Type ST Plug-in Relay Vane Relay, Alternating Current, Two Position, Track Relay 4F-4B Contacts, 110/55 Local Winding Volts, 2.0/1.0 Track Winding Volts, 100 Hz Frequency

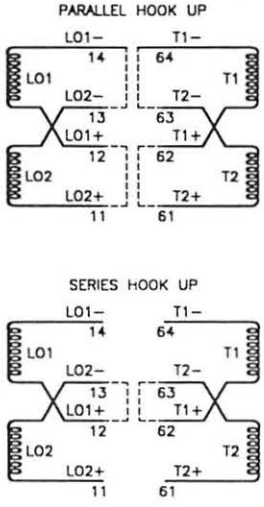
Coil Resistance/Tolerance:	67 Ohms +/- 10% (LOCAL), .4 Ohm +/-10% (TRACK)
Contact Arrangement:	4F-4B
Contact Material:	N.O. - Silver/Carbon N.C. & Movable - Silver
Contact Gap:	.050" to .055" (N.O.) .060" to .065" (N.C.)
Contact Pressure:	32 Grams Min. (N.O.) 25 Grams Min. (N.C.)
Contact Resistance Max:	40m Ohms Max at 10V 1.0A (N.O.) 20m Ohms Max at 10V 1.0A (N.C.)
Operate Time:	.2 Sec +/-10% (MAKE N.O.) at .484A, .142 Sec +/-10% at .484A (BREAK N.C.) at .484A
Vane Clearane:	.020" Min. Between Vane and Magnets
Vane Shaft and Play:	.003" to .005"
% DA Min:	80
DA Make N.C. Min:	.225A
DA Make Stop Min:	.100A
Pull-Up Max:	.315A
Work Max:	.440A
% Work Max:	150
Code Plate Register:	25 - 26 - 29 - 32

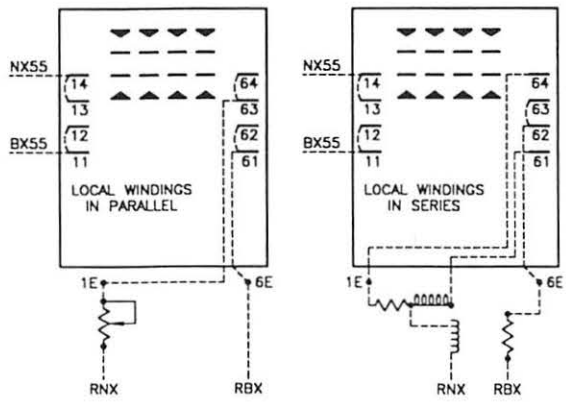
Notes

100V 100 Hz must be on local coil and current on track coil to obtain pull-up and drop-away.

Raise vane from backstop by hand and release, vane must strike and hold tight against back stop with local winding energized or de-energized.

Relay tested with windings in series at 100 Hz.

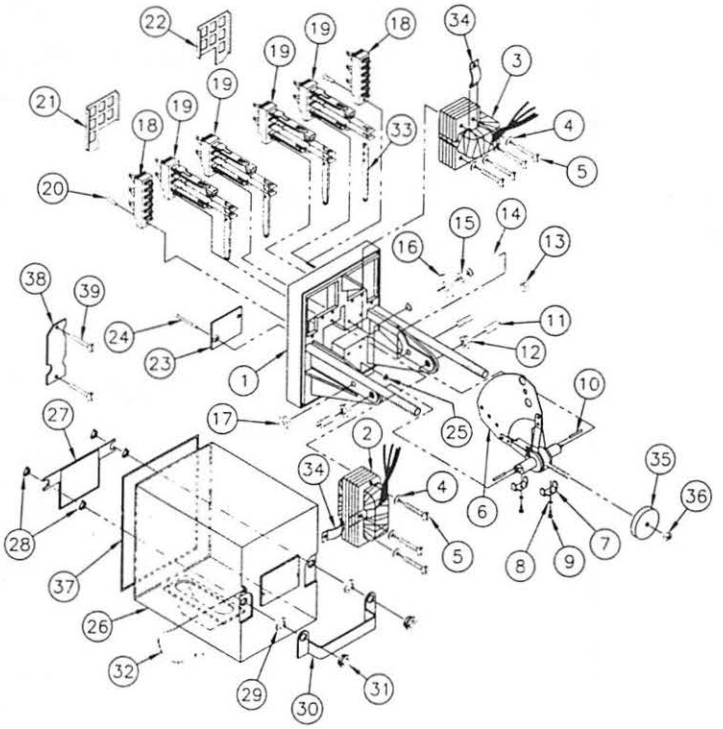




DOTTED WIRING IS PLUGBOARD WIRING

Part Number 450993

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 450993



To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd	Part No.	Item No.	Description	Qty. Req'd	Part No.
1	Base Assembly	1	420054-47	21	Dust Plate, L	1	420054-31
2	Coil, Local 110/55 V	1	420051-56X	22	Dust Plate, R	1	420054-32
3	Coil, Track 2.0/1.0 V	1	420051-57X	23	Cove Plate	1	420054-35
4	#8 Lock Washer	7	420054-56	24	Screw, #8-32 x 1.185"	1	420053-88
5	#8-32 Screw	7	420054-57	25	Nut, Hex #8-32 x .345"	1	420053-8
6	Vane & Shaft Assembly	1	420054-43	26	Clear Cover	1	420054-44
7	Clip, Pin Pusher	2	420054-58	27	Name Plate	1	420054-42
8	Lock Washer, #4, Clip	2	420053-15	28	Nut, 3/4-32 RD	2	420054-54
9	Screw, #4-40 x .250"	2	420053-14	29	Washer, Flat Rubber	2	420050-7
10	Pin, Operating Pusher	2	420054-49	30	Handle	1	420050-38
11	Bearing, Shaft	2	420054-39	31	Nut, Knurl, Locking	2	420050-5
12	Nut, Bearing	2	420054-55	32	Seal, Lead	1	420050-8
13	Bolt 1/4-28" x 4.125"	1	420054-46	33	Pusher	4	420054-38
14	Spacer	2	420054-50	34	Spring, Coil	2	420054-53
15	Stop Spacer	2	420054-52	35	Vane Weight	1	420054-33
16	Vane Stop	1	420054-51	36	Nut, #10-32 x .375" Hex	1	420054-21
17	Nut, 1/4-28 Hex	2	420000-66	37	Gasket, Cover	1	420050-12
18	Terminal Strip	2	420053-132	38	Plate, Code Pin	1	420054-59
19	Contact Stack Assembly	4	420052-28X	39	Screw, #6 - 32 x .5"	2	420050-36
20	Machine Screw	2	420050-36				

Safetran Systems Corporation
4650 Main Street. N.E.
Minneapolis, Minnesota 55421
612-586-3202

I&M # 410000-107
New 8/95

Safetran Systems

Part Number **450994**

Specification for Type ST Plug-in Relay Vane Relay, Alternating Current, Two Position, Track Relay 2F-2B Contacts, 110 Local Winding Volts, 5.0 Track Winding Volts, 60 Hz Frequency

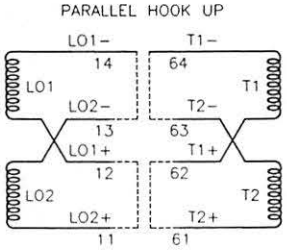
Coil Resistance/Tolerance:	144 Ohms +/- 10% (LOCAL), 5 Ohm +/-10% (TRACK)
Contact Arrangement:	2F-2B
Contact Material:	N.O. - Silver/Carbon N.C. & Movable - Silver
Contact Gap:	.050" to .055" (N.O.) .060" to .070" (N.C.)
Contact Pressure:	32 to 40 Grams Min. (N.O.) 29 to 35 Grams Min. (N.C.)
Contact Resistance Max:	40m Ohms Max at 10V 1.0A (N.O.) 20m Ohms Max at 10V 1.0A (N.C.)
Operate Time:	.2 Sec +/-10% (MAKE N.O.) at .484A, .142 Sec +/-10% at .484A (BREAK N.C.) at .484A
Vane Clearane:	.020" Min. Between Vane and Magnets
Vane Shaft and Play:	.003" to .005"
% DA Min:	67
DA Make N.C. Min:	.030A
DA Make Stop Min:	.005A
Pull-Up Max:	.049A
Work Max:	.058A
% Work Max:	125
Code Plate Register:	25 - 26 - 29 - 31

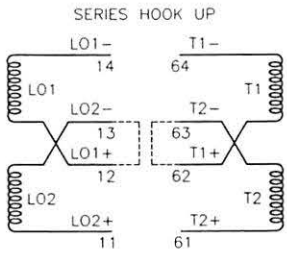
Notes

110V 60 Hz must be on local coil and current on track coil to obtain pull-up and drop-away.

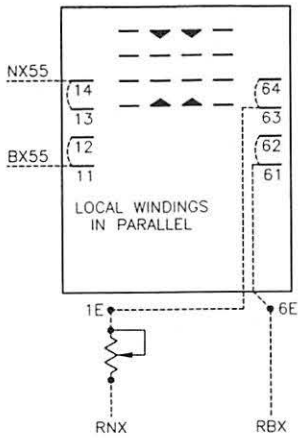
Raise vane from backstop by hand and release, vane must strike and hold tight against back stop.

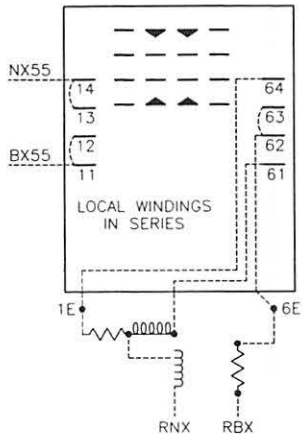
Relay tested with windings in series at 50/60 Hz, operate relay for at least 30 minutes before taking values.





T = TRACK WINDING
LO = LOCAL WINDING

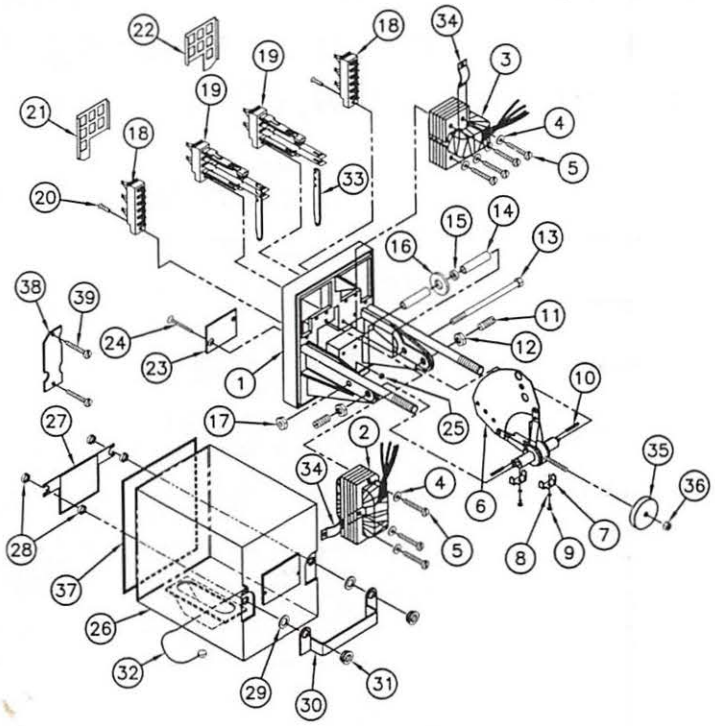




DOTTED WIRING IS PLUGBOARD WIRING

Part Number 450994

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 450994



To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd	Part No.	Item No.	Description	Qty. Req'd	Part No.
1	Base Assembly	1	420054-47	21	Dust Plate, L	1	420054-31
2	Coil, Local	1	420051-58X	22	Dust Plate, R	1	420054-32
3	Coil, Track	1	420051-59X	23	Code Plate	1	420054-63
4	#8 Lock Washer	7	420054-56	24	Screw, #8-32 x 1.185"	1	420053-88
5	#8-32 Screw	7	420054-57	25	Nut, Hex #8-32 x .345"	1	420053-8
6	Vane & Shaft Assembly	1	420054-43	26	Clear Cover	1	420054-44
7	Clip, Pin Pusher	2	420054-58	27	Name Plate	1	420054-65
8	Lock Washer, #4, Clip	2	420053-15	28	Nut, 3/4-32 RD	2	420054-54
9	Screw, #4-40 x .250"	2	420053-14	29	Washer, Flat Rubber	2	420050-7
10	Pin, Operating Pusher	2	420054-49	30	Handle	1	420050-38
11	Bearing, Shaft	2	420054-39	31	Nut, Knurl, Locking	2	420050-5
12	Nut, Bearing	2	420054-55	32	Seal, Lead	1	420050-8
13	Bolt 1/4-28" x 4.125"	1	420054-46	33	Pusher	2	420054-38
14	Spacer	2	420054-50	34	Spring, Coil	2	420054-53
15	Stop Spacer	2	420054-52	35	Vane Weight	1	420054-33
16	Vane Stop	1	420054-51	36	Nut, #10-32 x .375" Hex	1	420054-21
17	Nut, 1/4-28 Hex	2	420000-66	37	Gasket, Cover	1	420050-12
18	Terminal Strip	2	420053-132	38	Plate, Code Pin	1	420054-62
19	Contact Stack Assembly	2	420052-28X	39	Screw, #6 - 32 x .5"	2	420050-36
20	Machine Screw	2	420050-36				

Safetran Systems Corporation
4650 Main Street. N.E.
Minneapolis, Minnesota 55421
612-586-3202

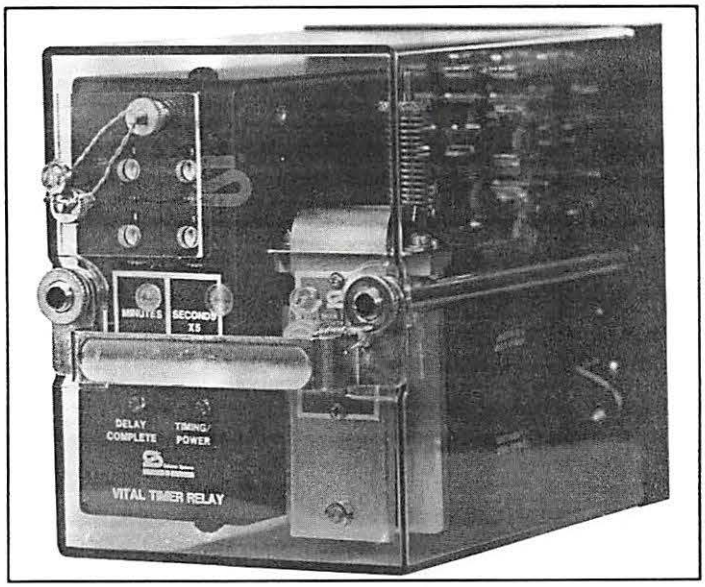
I&M # 410000-110
New 11/95

Safetran Systems

Part Number **451000-X**

Specification for Type ST Plug-in Vital Timer Relay 5 Seconds to 15 Minutes, 55 Seconds Range 2FB-3F-2B Contacts

General



The Safetran ST 451000-X Vital Timer Relay is designed to provide a precise, preset pick-up delay for time locking, electric switch lock releases and other vital signal timing applications for a nominal 12 volt system. It consists of a vital solid state electronic timer module mounted together with a Type ST neutral relay in a double-wide ST relay housing.

The electronic timer is adjustable in increments of five seconds, from 5 seconds minimum to 15 minutes, 55 seconds maximum. Timing starts upon application of power. At the end of the timing period, the relay will energize. The unit will respond only with input polarity as indicated.

The Unit replaces most electromechanical vital timer relays and is plug compatible with a GRS A62-627 timer relay.

Electronic Timer

The timer module consists of a digital electronic timer on two printed circuit boards in an aluminum housing. Timing is controlled by a high accuracy quartz crystal oscillator with an adjustable countdown divider to an accuracy of less than one second over the entire timing range. Switches protected by a removable front cover set the timing interval in increments of five seconds as indicated above. LED lamps are provided to indicate timing in progress and timing complete.

Timing commences when power is applied to the input terminals of the relay. If power remains on, the electronic module will energize the relay after the present interval. If power is interrupted before completion of the timing cycle, the timer is instantaneously reset. The full timing interval will commence when the input terminals are reenergized.

To assure vitality, the electronic timer module incorporates both a master and a check timer. Each is set independently to the desired timer interval. Both master and check timer must conclude the timer interval within one second of each other to activate the relay drive. Other vital internal checking is also continually performed.

Power for the internal relay is developed by and electronic relay driver within the unit. Relay drive, and thus relay pickup and dropaway, are independent of the input voltage to the unit. An electronic threshold detector stop the timing or, if the relay is picked up, drops it if the input voltage falls below that level. The reset level is also determined by the electronic threshold.

Pickup and dropaway levels on the relay tag represent these electronic threshold levels. These voltage levels may be tested in the same manner as the pickup and dropaway of any vital signal relay.

Part Number 451000-X

Output Relay

The relay is a nominal 12 volt, 500 ohm ST neutral type with 2FB-3F-2B contacts. The 2FB-3F contacts are silver/carbon and 2B contacts silver/silver. The coils of the relay are connected internally to the timer module and are not accessible externally.

Contact ratings are four amps@ 30 volts DC or AC, non inductive.

After time-out, the electronic relay driver provides proper drive for the relay for all operating voltages over the 9.5 vc threshold level of the unit. While the electronic module is timing, relay voltage is zero.

For shop test and service to determine actual pickup and dropaway of the relay itself, it is necessary to disconnect the relay from the electronic module and perform all tests typical of a DC neutral relay.

Timer Setting

Time is set by means of four screwdriver adjusted switches on the front of the relay located under a sealed clear cover. These are accessed by removing two #8 thumbscrews and removing the cover.

The upper two switches set time for the main timing channel and the lower two switches for the check timing channel. To operate, both main and check channels must be set for the same time interval.

The left switches set time in minutes and the right switches set time in seconds. Time on the seconds switch is in five (5) second increments and actual time is the switch reading x 5. The time set on minute and second switches i additive. Minute switches have active positions for 0 to 15. Second switches have active positions from 0 to 11 (0 55 seconds).

As an example, for six minutes, 45 seconds, the minutes (left) switch would be on 6 and the seconds (right) switch would be on 9.

The timer has a range from five seconds minimum to 15 minutes, 55 seconds maximum.

After setting required time, the clear cover over the switches should be replaced and thumbscrews tightened. A wir and lead seal will secure the time setting.

Operation

Timing begins upon applying nominal 12 volt energy to the + and - battery terminals of the unit. The TIMING/POWER lamp on the front panel will light indicating the electronic timer is operating. After the preset timer interval, the relay will energize. At the same time, the DELAY COMPLETE lamp will light, indicating that the relay is energized and the timing cycle is complete.

If battery energy is removed at any time during the timing cycle, the timer will reset and will restart for the full time cycle upon reapplication of energy. If battery energy is removed at any time after the timing cycle is complete, the relay will deenergize immediately. Upon reapplication of energy, the full time cycle will run before the relay is again energized.

Specifications

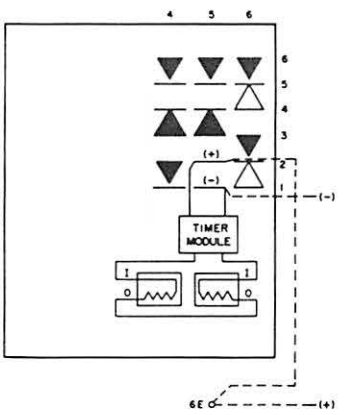
Dimensions:	Safetran ST-2 Relay Housing and Base
Weight:	9.5 Pounds
Timing Range:	5 Seconds to 15 Minutes, 55 Seconds in 5 Second Steps
Input Voltage:	9.5-16 Volts DC, Battery or Filtered Supply
Input Current:	0.2 Amp
Temperature:	-40C to 71C (+40F to 160F)
Relative Humidity:	5% to 95%, Non-condensing

Specification for Type ST Plug-in Vital Timer Relay
5 Seconds to 15 Minutes, 55 Seconds Range
2FB-3F-2B Contacts

Characteristic				Original Requirements
Time Relay	Voltage Range			9.6-16 VDC
	Operating Current			200 milliamps
	Timing Range			5 sec to 15 min-55 se
	Timing Increment			5 sec
	Timing Accuracy			±1 sec
	Temperature Range			-40C (-40F) to 71C (160F)
Relay Only	Coils	Nominal Voltage		12 VDC
		Resistance		25 Ohm ± 5% each coil
	P.U. W.C.	Voltage		6.05 volts Maximum
		Current		12.1 milliamps Maximum
	D.A.	Voltage		2.85 volts Maximum
		Current		5.7 milliamps Maximum
	Contacts	Arrangment		2FB-3F-2B
		Rating		4 Amps/30 Volts
		Material	2FB-3F	Silver/Carbon
			2B	Silver/Silver
		Dynamic Gap		.020" Minimum
		Contact Gap		.050" Minimum
		Pressure	Back (S/S)	21 grams Minimum
			Front (C/S)	45 grams Minimum
			Back (S/C)	25 grams Minimum
		Overtravel per Adjustment A		*See Notes Below
		Resistance	N.O.	40 milliohms Maximum @10 VDC, 1.0 Amps
			N.C.	20 milliohms Maximum @10 VDC, 1.0 Amps
	Armature Travel			.087" Minimum
	Retainer Gap Reference			.002" to .004"
	Residual Screw (Adjustable)			.010" Minimum
	Stop Pin (Fixed)			.008" Minimum

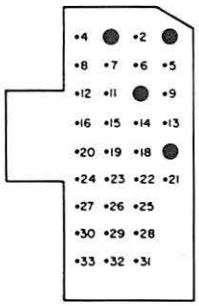
Contact/Coil Arrangement

(Front of Relay)



Relay Register

(Rear of Relay)



Notes

#1 N.O. Front contacts to make with .032" and break with .041" between armature residual screw and core. N.C. Back Contacts to make with .066" and break with .059" between armature residual screw and core.

#2 Adjust armature compression spring to have 2 ounce (56.7 grams) minimum at the adjustable residual screw to just raise the armature stop.

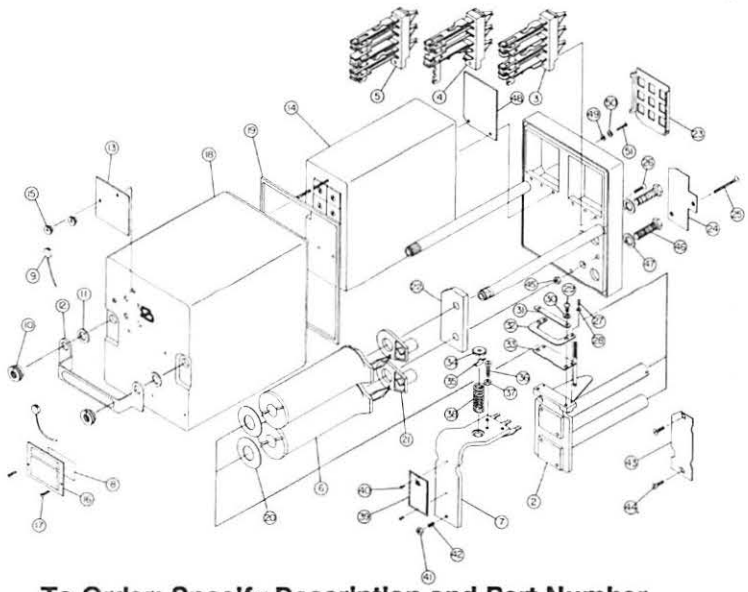
Field Requirements

Drop Away Value - Not less than 70% of original marking.
Pickup/Working Value - Not greater than 110% of original marking.

Shop Requirements

Drop Away Value - Not less than 95% of original marking
Pickup/Working Value - Not greater than 105% of original marking.

Type ST Plug-in Relay
Assembly and Replacement Parts
Part Number 451000-X



To Order: Specify Description and Part Number

Item Number	Description	Qty. Req'd	Part Number	Item Number	Description	Qty. Req'd	Part Number
1	Base Assembly	1	420053-138X				
2	Frame Assembly	1	420053-X	28	Washer, Spring Lock, I, #4	2	420053-15
3	Stack, 2F-1B Contact	1	420052-18X	29	Machine Screw, Pan Head		
4	Stack, 1F-1B Contact	1	420052-17X		#8-32 X .375"	2	420053-16
5	Stack, 2FB Contact	1	420052-1X	30	Washer, Spring Lock, I, #8	2	420050-33
6	Coil Assembly, 250 Ohm	2	420052-49X	31	Plate, Retainer	1	420053-3
7	Armature	1	420053-1X	32	Retainer, Armature	1	420053-2
8	Label, Paper Identification	1	420050-3	33	Plate, Hinge	1	420053-1
9	Lead Seal	2	420050-8	34	Nut, Spring Post	1	420053-6
10	Nut, Knurl, Locking	2	420050-5	35	Key, Spring Retainer	1	420053-5
11	Washer, Flat Rubber	2	420050-7	36	Screw, Tailstop	1	420053-9
12	Handle	1	420050-38	37	Nut, Tailstop	1	420053-8
13	Cover, Access	1	D38250	38	Spring, Compression	1	420053-4
14	Timer Unit	1	91060	39	Nameplate	1	420053-136
15	Cover Unit, Knurl Nut	2	A451000-N	40	Phillips Screw, Pan Head,		
16	Cover, Nameplate	1	420050-2		#4-40 X .187"	2	420053-18
17	Tap Screw, Round Head,			41	Nut, Residual	1	420053-10
	#4 X .375"	2	420050-35	42	Screw, Residual	1	420053-11
18	Molded Cover, Clear	1	420050-37	43	Plate, Code Pin	1	420053-130
19	Gasket, Cover	1	420050-12	44	Machine Screw, Flat Head,		
20	Washer, Spring	2	420053-7		#6-32 X .5"	2	420050-36
21	Insulator, Terminal Retainer	2	420051	45	Nut, Hex, #8-32 X .345"	1	420053-8
22	Plate, Base	1	420053	46	Machine Screw, Hex Head,		
23	Seal, Dust	1	420052		5/16" -24 X 1.125"	2	420053-12
24	Code, Plate	1	420050-540	47	Washer, Spring Lock, I, 5/16"	2	420053-13
25	Screw, Flat Head,			48	Bottom Cover Plate	1	D38263
	#8-32 X 1.185"	1	420053-88	49	Washer, #6 Flat	2	1706-SN
26	Machine Screw, Flat Head,			50	Washer, #6 Split Lock	2	1804-MZ
	#6-32 x .531"	3	420050-36	51	Screw, #6-32 X 5/8" Pan Head	2	PS-6C-10-001
27	Machine Screw, Fillister Head,						
	#4-40 X .250"	2	420053-14				

Safetran Systems Corporation
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(612) 586-3202

I&M # 410000-85
Revised 10/96

Safetran

SHELF TYPE DC FLASHER RELAY

MODEL E-1

- HEAVY DUTY LAMP CONTACTS
- OPERATING RANGE OF 35 TO 55 CYCLES PER MINUTE
- CAN BE WALL OR SHELF MOUNTED

The Safetran Model E-1 DC Flasher Relay is used for alternately operating flashing lamps at a grade crossing.

The E-1 Relay has two operating coils of 500 ohms which are alternately energized by internal operating contacts. These cause the armature to oscillate at a normal 45 cycles per minute. The armature carries four separate lamp contacts to alternately operate the lamps at a highway grade crossing.

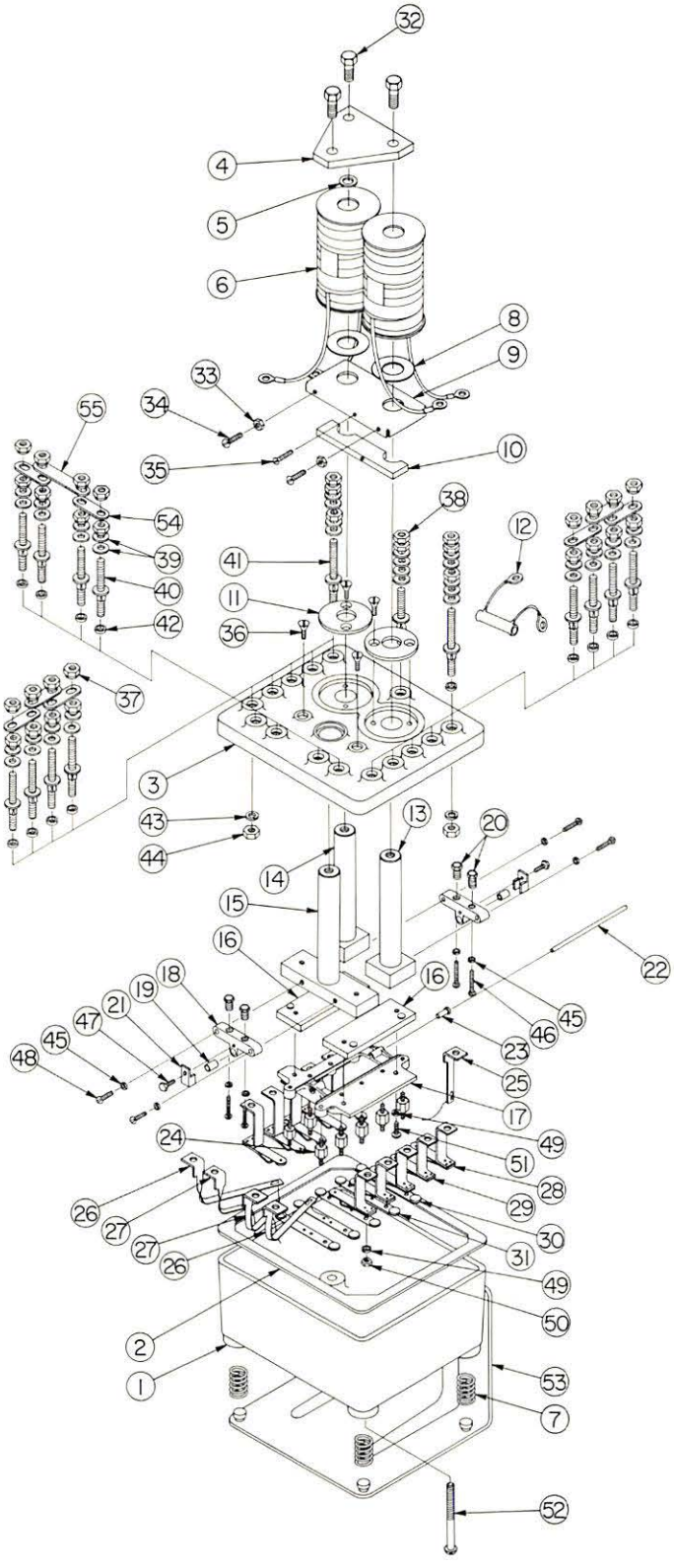
The lamp contacts are silver alloy and are each rated at 10 amperes AC or DC up to 30 volts. They may be connected in multiple for higher operating current.

Operating frequency is determined by the coil inductive reactance. This is varied by an adjustment screw which provides an operating range of 35 to 55 cycles per minute. A resistor supresses arcing and RF interference from the operating contact.

Normal voltage is 12 volts DC. Operating voltage range is 6.5 to 16.0 volts DC.

Contact locations and terminal designations are shown on the nameplate located on the front of the relay. Terminals are AAR post type. The relay can be either wall or shelf mounted as desired.

DC FLASHER RELAY ASSEMBLY



DC FLASHER RELAY REPLACEMENT PARTS

To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Shield	1	040339-X	33	Nut, Machine, #10-32	2	040758
2	Gasket	1	040340	34	Machine Screw, Round Head, #10-32 x .75"	2	2619-RBN
3	Plate, Top	1	040342-X				
4	Yoke, Relay	1	040349-A	35	Machine Screw, Round Head, #6-40 x .875"	1	2830-RBN
5	Washer, Residual	1	040575				
6	Coil, Relay, 500 Ohm	2	040372-16X	36	Machine Screw, Flat Head, #10-32 x 1"	6	2621-FBN
7	Spring	4	040739				
8	Washer, Cork	2	040524-A	37	Nut, Binding	28	023831
9	Support, Coil	1	040345	38	Nut, Clamp	4	023832
10	Armature, Adjusting	1	040348-A	39	Washer, Beveled	37	023834
11	Washer, Retarding	2	040343	40	Post, Short	13	040306-B
12	Resistor, 3500 Ohm	1	040362-4YX	41	Post, Long	2	040306-7B
13	Core, Right	1	040351-1A	42	Washer, Sealing	15	040307
14	Core, Left	1	040351-A	43	Washer, Spring Lock, M, 1/4"	15	1808-MZ
15	Core, Front	1	040350-AX	44	Nut, Machine, #14-24	15	040759
16	Armature	2	040352-AX	45	Washer, Spring Lock, M, #8	8	1805-MZ
17	Support, Armature	1	040353-1	46	Machine Screw, Round Head, #8-32 x .75"	4	2577-RBN
18	Bracket, Bearing	2	040356				
19	Bearing	2	040355	47	Machine Screw, Hex Head, #6-32 x .25"	2	2832
20	Sleeve, Adjusting	2	040320				
21	Retainer, Trunnion	2	040382	48	Machine Screw, Round Head, #8-32 x .625"	4	2576-RBN
22	Trunnion	1	040354-A				
23	Bushing, Armature Bracket	2	040316-1	49	Washer, Spring Lock, M, #10	14	1806-MZ
24	Stud, Insulating	10	040528-CX	50	Nut, Machine, #10-32	10	2015-BN
25	Strip, Connecting	1	040334-2X	51	Machine Screw, Round Head, #10-32 x .37"	4	2614-RBN
26	Strip, Connecting	2	040334-1X				
27	Strip, Connecting	2	040334-X	52	Machine Screw, Round Head, #14-24 x 2.75"	2	2816-RBN
28	Contact, Operating	2	040357-3X				
29	Contact, Lamp	8	040357-4X	53	Hanger, Wall	1	040364-3X
30	Heel, Operating	1	040360-2X	54	Connector, Terminal	8	023839-2
31	Heel, Lamp	4	040360-AX	55	Connector, Terminal	1	023839-1
32	Cap Screw, Hex Head, 5/16"-18 x .75"	3	4044-HSN				

ORDERING INFORMATION

To Order: Specify Description and Part Number

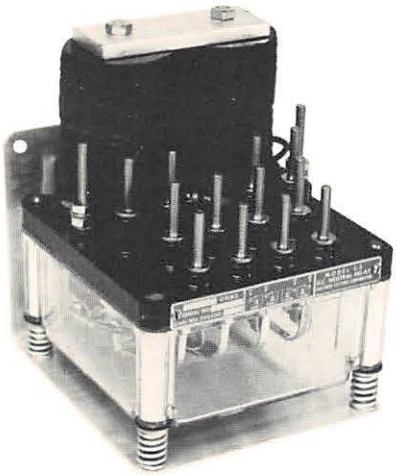
Description	Dimensions in Inches			Weight in Pounds	Part Number
	Height	Width	Length		
Model E-1 DC Flasher Relay	9.125	7.5	7.25	15.5	040300-17HX

Note: The Model E-1 DC Flasher Relay is shipped with a factory set operation of 45 cycles per minute. Dimensions and weight are of relay complete with mounting bracket.

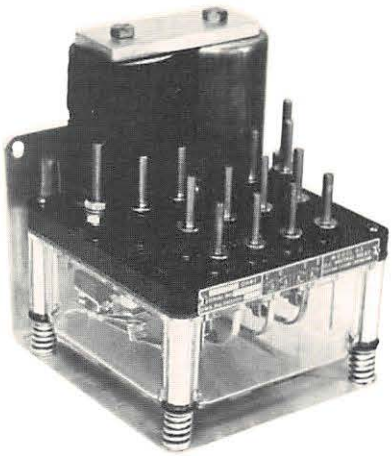
Safetran

SHELF TYPE NEUTRAL RELAYS

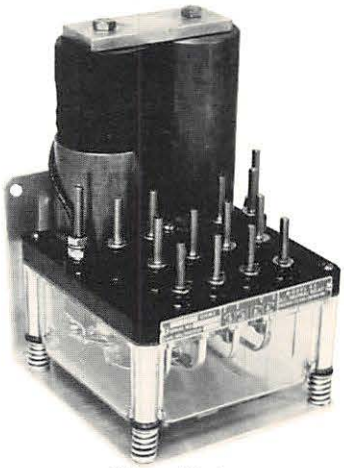
MODEL E-5



Regular Release



Slow Release
(0.9 Second Delay)



Slow Release
(3.5 Second Delay)

Model E-5 Relays are vital signal relays used for neutral line relays, and track circuit applications. They meet all requirements of AAR Signal Manual Part 123. These relays can be furnished with regular, 0.9 second delay, and 3.5 second delay releases.

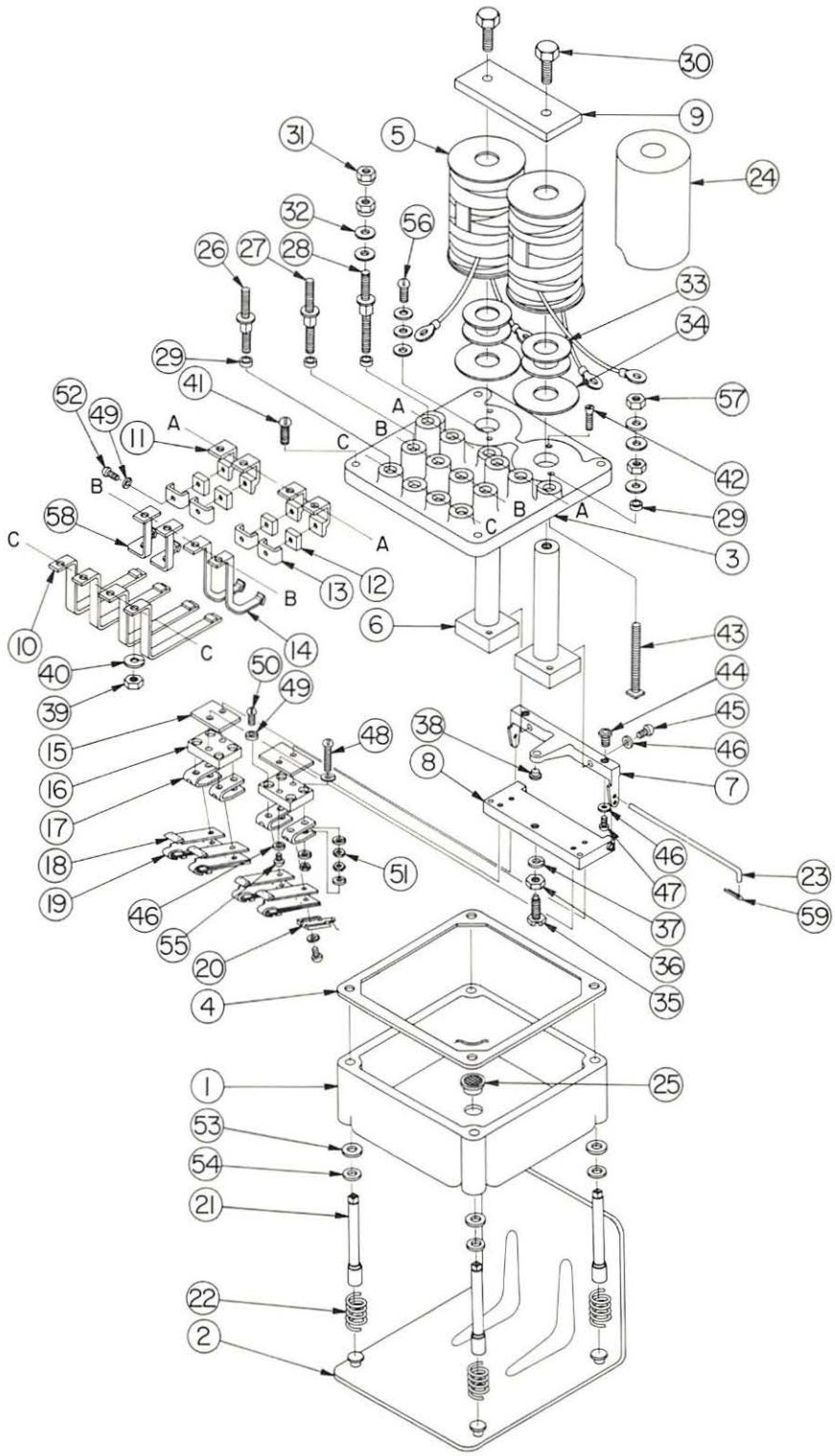
Model E-5 relays are available with either 4 or 6 dependent, heavy duty, front and back contacts. Front contacts are silver impregnated carbon; back contacts are silver alloy. Both are rated to carry 10 amperes continuously at 30 volts or less, AC or DC.

Contact locations and terminal designations are shown on the nameplate located on the front of the relay. Terminals are AAR post type.

These relays can be either wall or shelf mounted as desired.

NEUTRAL RELAY ASSEMBLY

REGULAR RELEASE AND SLOW RELEASE (.9 SECOND DELAY) 4 FRONT AND BACK CONTACTS



NEUTRAL RELAY REPLACEMENT PARTS

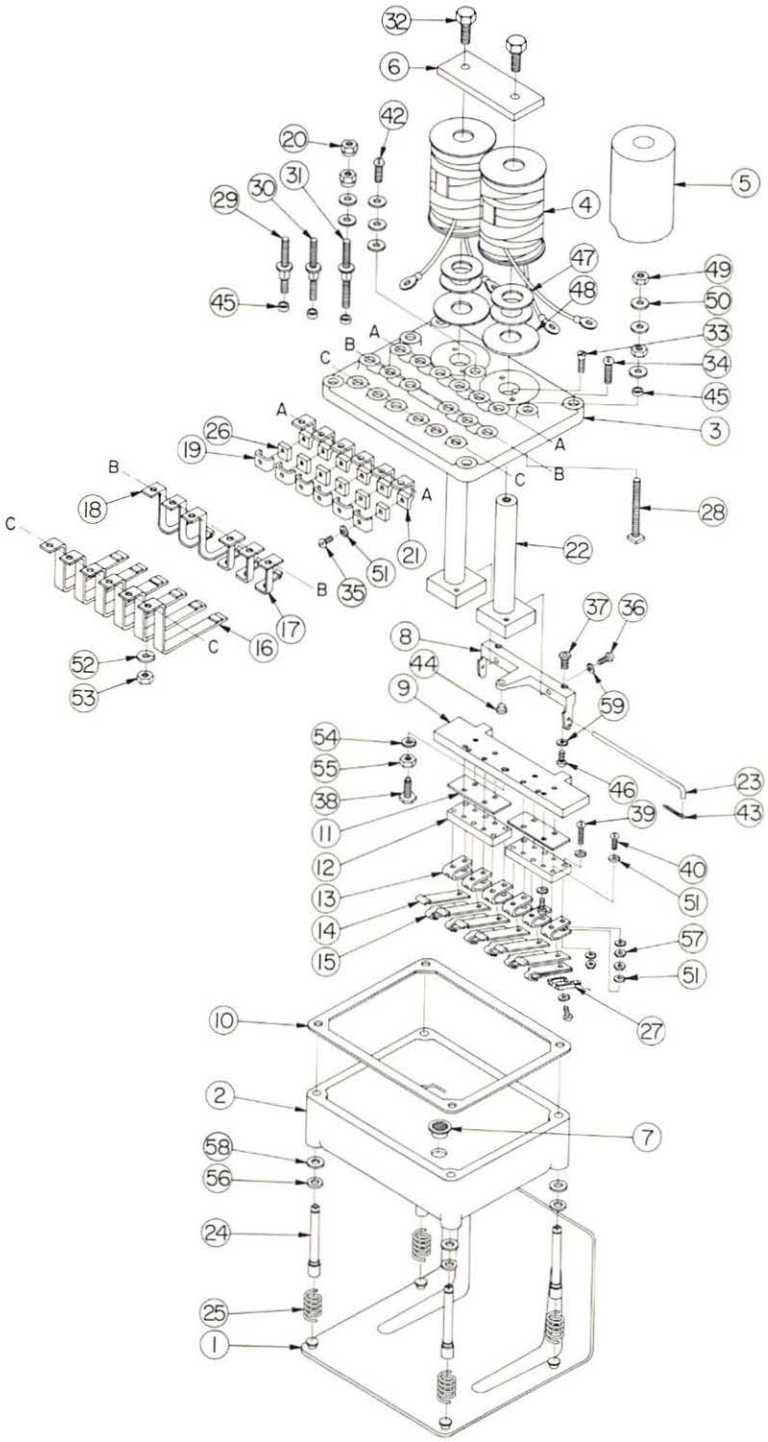
REGULAR RELEASE AND SLOW RELEASE (.9 SECOND DELAY) 4 FRONT AND BACK CONTACTS

To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Shield	1	040301-5	32	Washer, Beveled	37	023834
2	Hanger, Wall	1	040364-1AX	33	Washer, Cork	4	040524-A
3	Plate, Top	1	040310-AX	34	Washer, Insulating	2	040371
4	Gasket	1	040305	35	Screw, Stop	1	040318
5	Coil, Relay, 1 Ohm	2	040372-X	36	Nut, Machine, #10-32	1	2015-BN
	Coil, Relay, 2 Ohm	2	040372-2X	37	Washer, Spring Lock, M, #10	1	1806-MZ
	Coil, Relay, 75 Ohm	2	040372-8X	38	Pin, Stop	1	040335
	Coil, Relay, 250 Ohm	2	040372-12X	39	Nut, Machine, #14-24	12	040759
	Coil, Relay, 500 Ohm	2	040372-16X	40	Washer, Spring Lock, M, 1/4"	12	1808-MZ
	Coil, Relay, 1000 Ohm	1	040372-19X	41	Machine Screw, Round Head, #10-32 x .75"	4	2619-RBN
6	Core	2	040314-1B				
7	Bracket, Armature	1	040319	42	Machine Screw, Flat Head, #10-32 x 1"	4	2621-FBN
8	Armature	1	040315-AX				
9	Yoke, Relay	1	040313-A	43	Post, Terminal	2	023833
10	Strip, Connecting	4	040334	44	Sleeve, Adjusting	2	040320
11	Support, Contact	4	040330	45	Machine Screw, Round Head, #8-32 x .625"	2	2576-RBN
12	Contact, Carbon	4	030601-1				
13	Clamp, Contact	4	040331	46	Washer, Spring Lock, M, #8	8	1805-MZ
14	Support, Right	2	040332-3BX	47	Machine Screw, Round Head, #8-32 x .75"	2	2577-RBN
15	Plate, Insulating	2	040322				
16	Block, Insulating	2	040321-7X	48	Machine Screw, Round Head, #6-40 x .875"	4	2821-RE
17	Support, Finger	4	040323				
18	Contact, Front	4	040324-2AX	49	Washer, Spring Lock, M, #6	28	1804-MZ
19	Contact, Back	4	040326-1DX	50	Machine Screw, Round Head, #6-40 x .25"	8	2824-RE
20	Connector	4	040329-3BX				
21	Post, Corner	4	040302-B	51	Nut, Hex, #6-40	12	2011-BN
22	Spring	4	040739	52	Machine Screw, Round Head, #6-40 x .5"	4	2826-RE
23	Trunnion	1	040723-1				
24	Slug, Copper, 3-17/32"	1	040365-5	53	Washer, Cushion	4	040304-1
25	Ventilator	1	040506	54	Washer, Post	4	040303-1
26	Post, Short	4	040306-B	55	Machine Screw, Round Head, #8-32 x .5"	4	2574-RBN
27	Post, Medium	4	040306-1B				
28	Post, Long	4	040306-2B	56	Machine Screw, Round Head, #14-24 x .5"	1	2838
29	Washer, Sealing	14	040307				
30	Cap Screw, Hex Head, 5/16"-18 x .75"	2	4044-HSN	57	Nut, Clamp	4	023832
				58	Support, Left	2	040332-2BX
31	Nut, Binding	28	023831	59	Pin, Cotter, 1/16" x .5"	1	1000-E

NEUTRAL RELAY ASSEMBLY

REGULAR RELEASE AND SLOW RELEASE (.9 SECOND DELAY) 6 FRONT AND BACK CONTACTS



NEUTRAL RELAY REPLACEMENT PARTS

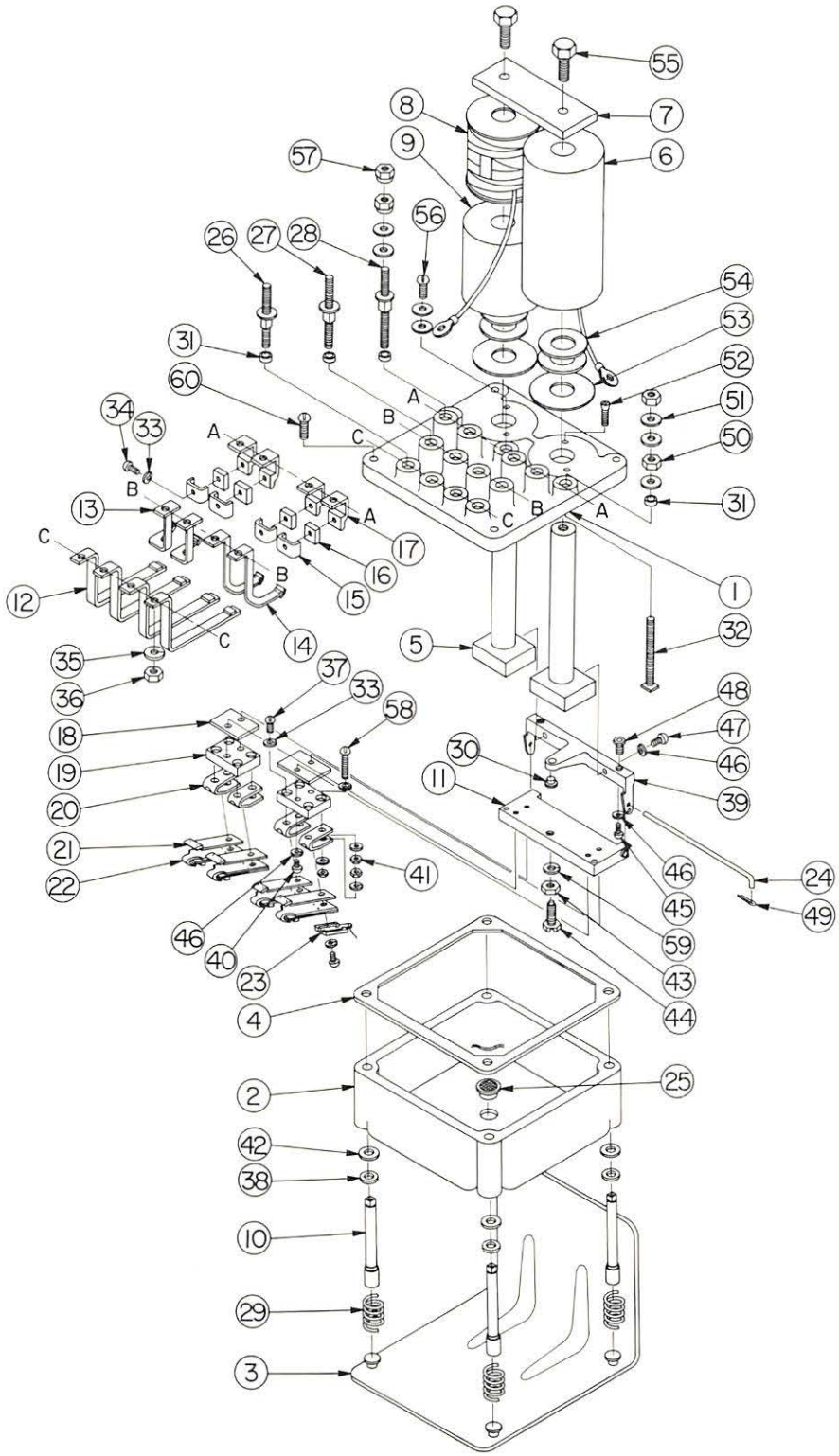
REGULAR RELEASE AND SLOW RELEASE (.9 SECOND DELAY) 6 FRONT AND BACK CONTACTS

To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Hanger, Wall	1	040364-2AX	33	Machine Screw, Flat Head, #10-32 x 1"	4	2621-FBN
2	Shield	1	040301-4				
3	Plate, Top	1	040310-3	34	Machine Screw, Round Head, #10-32 x .75"	4	2619-RBN
4	Coil, Relay, 1 Ohm	2	040372-X				
	Coil, Relay, 2 Ohm	2	040372-1X	35	Machine Screw, Round Head, #6-40 x .5"	6	2826-RE
	Coil, Relay, 75 Ohm	2	040372-8X				
	Coil, Relay, 250 Ohm	2	040372-12X	36	Machine Screw, Round Head, #8-32 x .625"	2	2576-RBN
	Coil, Relay, 500 Ohm	2	040372-16X				
	Coil, Relay, 1000 Ohm	1	040372-19X	37	Sleeve, Adjusting	2	040320
5	Slug, Copper, 3-17/32"	1	040365-5	38	Screw, Stop	1	040318
6	Yoke, Relay	1	040313-A	39	Machine Screw, Round Head, #6-40 x .875"	6	2821-RE
7	Ventilator	1	040506				
8	Bracket, Armature	1	040319	40	Machine Screw, Round Head, #6-40 x .25"	12	2824-RE
9	Armature	1	040315-3AX				
10	Gasket	1	040305-1	41	Machine Screw, Round Head, #8-32 x .5"	8	2574-RBN
11	Plate, Insulating	2	040322-1				
12	Block, Insulating	2	040321-1	42	Machine Screw, Round Head, #14-24 x .5"	1	2838
13	Support, Finger	6	040323				
14	Contact, Front	6	040324-2AX	43	Pin, Cotter, 1/16" x .5"	1	1000-E
15	Contact, Back	6	040326-1DX	44	Pin, Stop	1	040335
16	Strip, Connecting	6	040334	45	Washer, Sealing	20	040307
17	Support, Right	3	040332-3BX	46	Machine Screw, Round Head, #8-32 x .75"	2	2577-RBN
18	Support, Left	3	040332-2BX				
19	Clamp, Contact	6	040331	47	Washer, Cork	4	040524-A
20	Nut, Binding	40	032831	48	Washer, Insulating	2	040371
21	Support, Contact	6	040330	49	Nut, Clamp	4	023832
22	Core	2	040314-A	50	Washer, Beveled	37	023834
23	Trunnion	1	040723-1	51	Washer, Spring Lock, M, #6	42	1804-MZ
24	Post, Corner	4	040302-B	52	Washer, Spring Lock, M, 1/4"	18	1808-MZ
25	Spring	4	040739	53	Nut, Machine, #14-24	18	040759
26	Contact, Carbon	6	030601-1	54	Washer, Spring Lock, M, #10	1	1806-MZ
27	Connector	6	040329-3BX	55	Nut, Machine, #10-32	1	2015-BN
28	Post, Terminal	2	023833	56	Washer, Post	4	040303-1
29	Post, Short	6	040306-B	57	Nut, Hex, #6-40	18	2011-BN
30	Post, Medium	6	040306-1B	58	Washer, Cushion	4	040304-1
31	Post, Long	6	040306-2B	59	Washer, Spring Lock, M, #8	12	1805-MZ
32	Cap Screw, Hex Head, 5/16"-18 x .75"	2	4044-HSN				

NEUTRAL RELAY ASSEMBLY

SLOW RELEASE (3.5 SECOND DELAY) 4 FRONT AND BACK CONTACTS



NEUTRAL RELAY REPLACEMENT PARTS

SLOW RELEASE (3.5 SECOND DELAY) 4 FRONT AND BACK CONTACTS

To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Plate, Top	1	040310-AX	35	Washer, Spring Lock, M, 1/4"	12	1808-MZ
2	Shield	1	040301-5	36	Nut, Machine, #14-24	12	040759
3	Hanger, Wall	1	040364-1AX	37	Machine Screw, Round Head, #6-40 x .25"	8	2824-RE
4	Gasket	1	040305				
5	Core	2	040314-1B	38	Washer, Post	4	040303-1
6	Slug, Copper, 5-3/32"	1	040365-7	39	Bracket, Armature	1	040319
7	Yoke, Relay	1	040313-A	40	Machine Screw, Round Head, #8-32 x .5"	4	2574-RBN
8	Coil, Relay, 250 Ohm	1	040373-51X				
9	Slug, Copper, 2-11/16"	1	040365-6	41	Nut, Hex, #6-40	12	2011-BN
10	Post, Corner	4	040302-B	42	Washer, Cushion	4	040304-1
11	Armature	1	040315-AX	43	Nut, Machine, #10-32	1	2015-BN
12	Strip, Connecting	4	040334	44	Screw, Stop	1	040318
13	Support, Left	2	040332-2BX	45	Machine Screw, Round Head, #8-32 x .75"	2	2577-RBN
14	Support, Right	2	040332-3BX				
15	Clamp, Contact	4	040331	46	Washer, Spring Lock, M, #8	8	1805-MZ
16	Contact, Carbon	4	030601-1	47	Machine Screw, Round Head, #8-32 x .625"	2	2576-RBN
17	Support, Contact	4	040330				
18	Plate, Insulating	2	040322	48	Sleeve, Adjusting	2	040320
19	Block, Insulating	2	040321-7X	49	Pin, Cotter, 1/16" x .5"	1	1000-E
20	Support, Finger	4	040323	50	Nut, Clamp	4	023832
21	Contact, Front.	4	040324-2AX	51	Washer, Beveled	36	023834
22	Contact, Back	4	040326-1DX	52	Machine Screw, Flat Head, #10-32 x 1"	4	2621-FBN
23	Connector	4	040329-3BX				
24	Trunnion	1	040723-1	53	Washer, Insulating	2	040371
25	Ventilator	1	040506	54	Washer, Cork	4	040524-A
26	Post, Short	4	040306-B	55	Cap Screw, Hex Head, 5/16"-18 x .75"	2	4044-HSN
27	Post, Medium	4	040306-1B				
28	Post, Long	4	040306-2B	56	Machine Screw, Round Head, #14-24 x .5"	1	2838
29	Spring	4	040739				
30	Pin, Stop	1	040335	57	Nut, Binding	28	023831
31	Washer, Sealing	14	040307	58	Machine Screw, Round Head, #6-40 x .875"	4	2821-RE
32	Post, Terminal	2	023833				
33	Washer, Spring Lock, M, #6	28	1804-MZ	59	Washer, Spring Lock, M, #10	1	1806-MZ
34	Machine Screw, Round Head, #6-40 x .5"	4	2826-RE	60	Machine Screw, Round Head, #10-32 x .75"	4	2619-RBN

ORDERING INFORMATION

To Order: Specify Description and Part Number

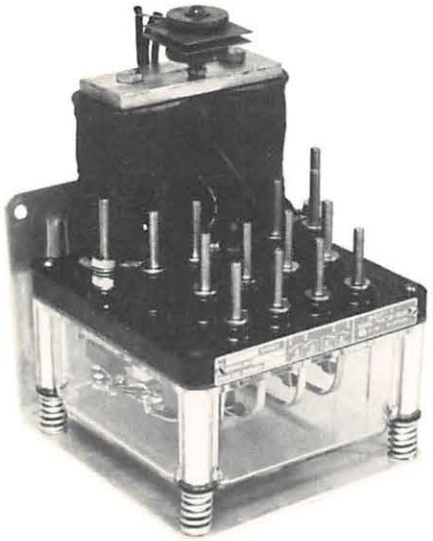
Description	Total Ohms	Maximum P.U. & W.C. Amperes	Number of Contacts	Dimensions in Inches			Weight in Pounds	Part Number
				Height	Width	Length		
Model E-5 Neutral Relay Regular Releasing	2	.105	4	8	6.25	6.75	12.25	040300-26AX
Model E-5 Neutral Relay Regular Releasing	2	.1196	6	8	7.5	6.75	13.25	040300-104AX
Model E-5 Neutral Relay Regular Releasing	4	.070	4	8	6.25	6.75	11	040300-26BX
Model E-5 Neutral Relay Regular Releasing	4	.087	6	8	7.5	6.75	12	040300-104BX
Model E-5 Neutral Relay Regular Releasing	150	.045	4	8	6.25	6.75	11	040300-26EX
Model E-5 Neutral Relay Regular Releasing	150	.060	6	8	7.5	6.75	12	040300-104EX
Model E-5 Neutral Relay Regular Releasing	500	.0060	4	8	6.25	6.75	12.5	040300-26HX
Model E-5 Neutral Relay Regular Releasing	500	.0075	6	8	7.5	6.75	13.5	040300-104HX
Model E-5 Neutral Relay Regular Releasing	1000	.0044	4	8	6.25	6.75	11.75	040300-26JX
Model E-5 Neutral Relay Regular Releasing	1000	.0055	6	8	7.5	6.75	12.75	040300-104JX
Model E-5 Neutral Relay Slow Release (.9 second delay)	500	.009	4	8	6.25	6.75	14.5	040300-60HX
Model E-5 Neutral Relay Slow Release (.9 second delay)	500	.0092	6	8	7.5	6.75	16	040300-114HX
Model E-5 Neutral Relay Slow Release (.9 second delay)	1000	.0058	4	8	6.25	6.75	14.5	040300-60JX
Model E-5 Neutral Relay Slow Release (.9 second delay)	1000	.0052	6	8	7.5	6.75	16	040300-114JX
Model E-5 Neutral Relay Slow Release (3.5 second delay)	250	.0129	4	9.5	6.25	6.75	20	040300-63FX

Note: Dimensions and weight are of Relays complete with mounting bracket.

Safetran

POWER TRANSFER RELAY

MODEL E-7



- HEAVY DUTY FRONT AND BACK CONTACTS
- EQUIPPED WITH SELENIUM RECTIFIER FOR 10-12 VAC OPERATION
- CAN BE WALL OR SHELF MOUNTED

The Model E-7 Power Transfer Relay transfers power from an AC source to a standby battery source in the event of AC power interruption. It meets all requirements of AAR Manual Part 53 except size as the Model E-7 is available in 4 or 6 rather than 2 pole. A selenium rectifier, mounted on the relay and connected with the coils, allows for nominal 10-12 VAC operation. Springs mounted on the armature assist gravity and assure good back contact pressure.

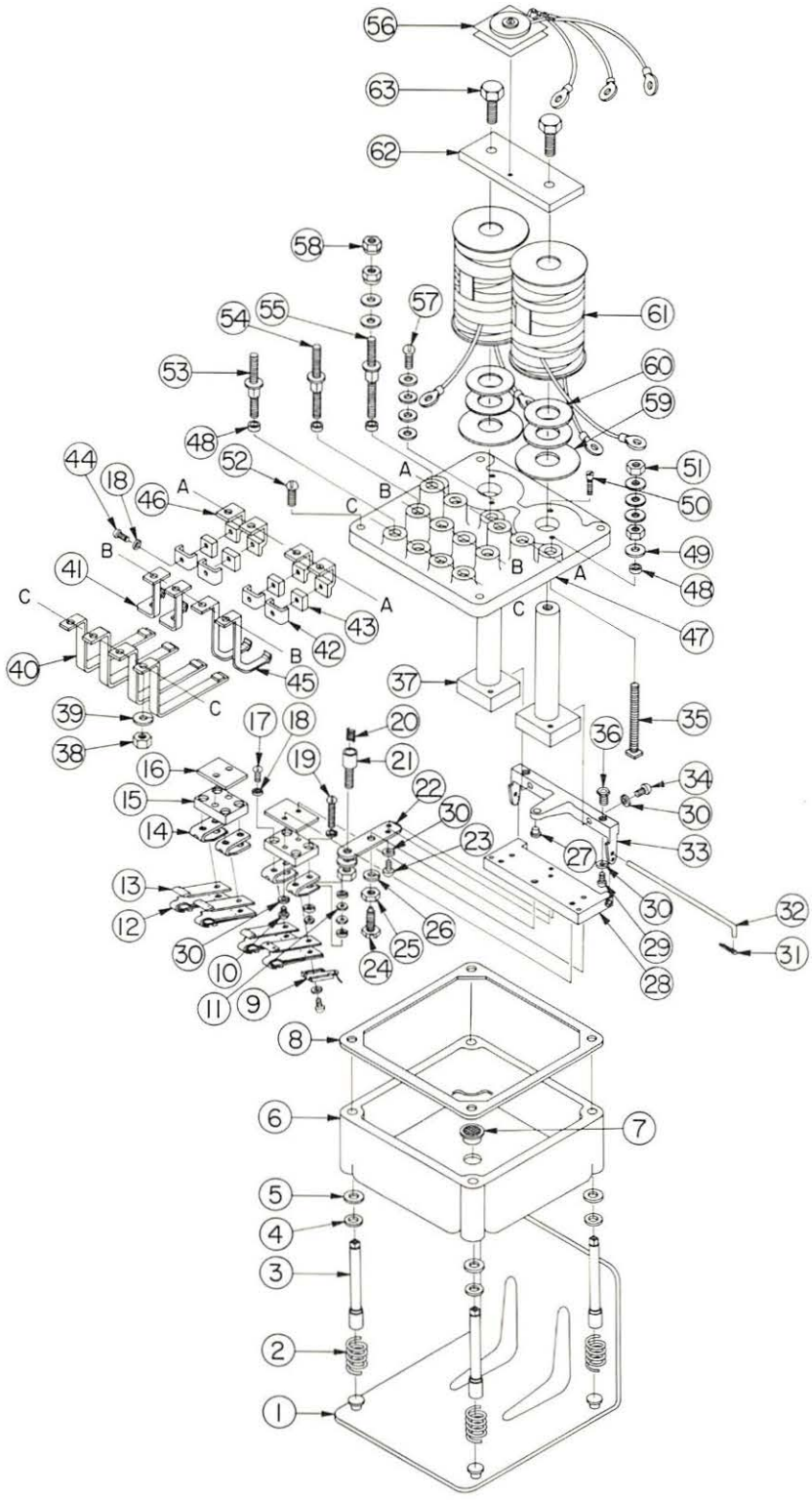
The Model E-7 is available with either 4 or 6 heavy duty front and back contacts. Front contacts are of silver impregnated carbon. Back contacts are silver alloy. Both are rated to carry ten amperes continuously at 30 volts or less.

Contact locations and terminal designations are shown on the nameplate located on the front of the relay. Terminals are AAR post type.

The relay can either be wall or shelf mounted as desired.

POWER TRANSFER RELAY ASSEMBLY

4 FRONT AND BACK CONTACTS



POWER TRANSFER RELAY REPLACEMENT PARTS

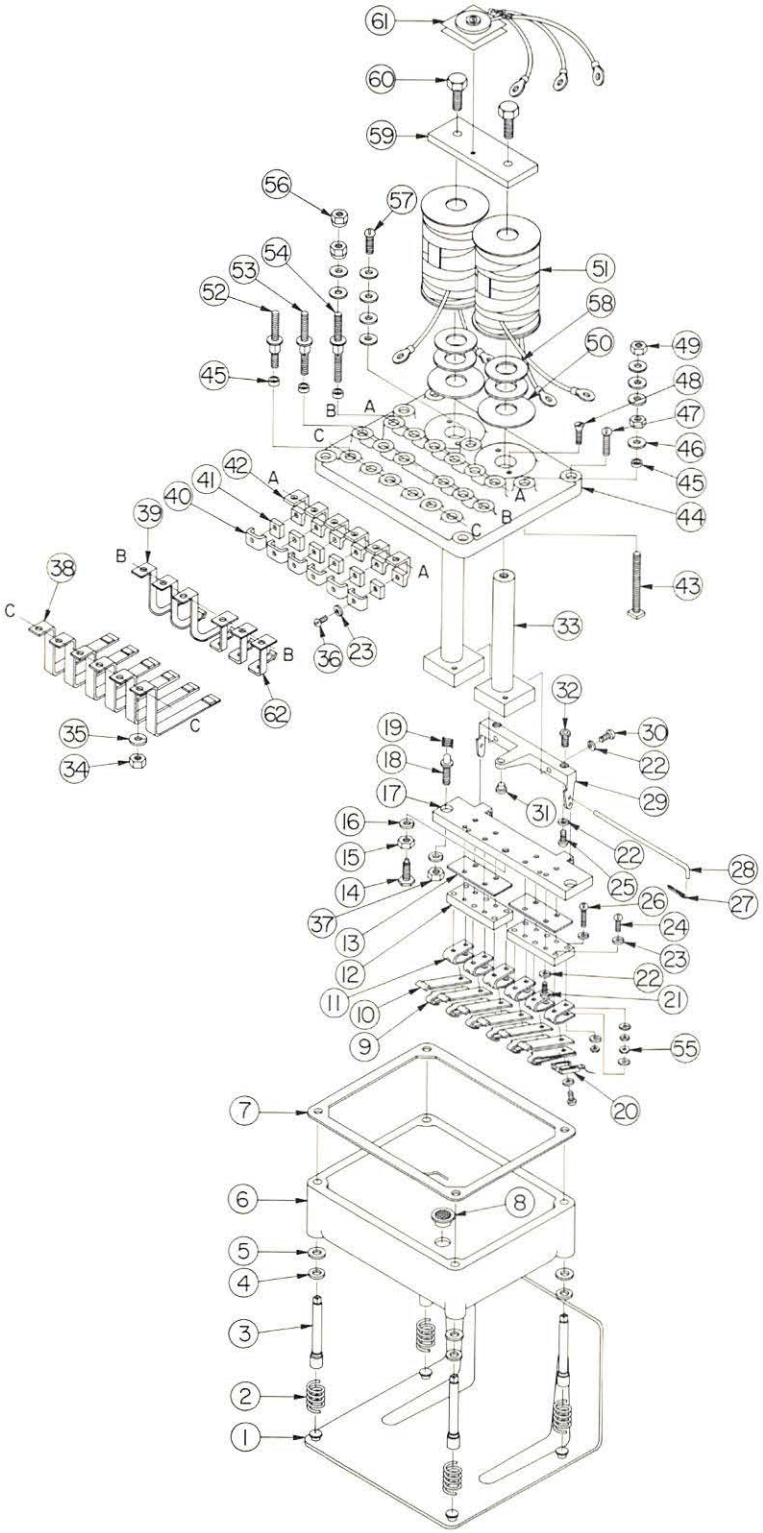
4 FRONT AND BACK CONTACTS

To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Hanger, Wall	1	040364-1AX	33	Bracket, Armature	1	040319
2	Spring	4	040739	34	Machine Screw, Round Head, #8-32 x .625"	2	2576-RBN
3	Post, Corner	4	040302-B				
4	Washer, Post	4	040303-1	35	Post, Terminal	2	023833
5	Washer, Cushion	4	040304-1	36	Sleeve, Adjusting	2	040320
6	Shield	1	040301-5	37	Core	2	040314-A
7	Ventilator	1	040506	38	Nut, Machine, #14-24	13	040759
8	Gasket	1	040305	39	Washer, Spring Lock, M, 1/4"	13	1808-MZ
9	Connector	4	040329-3BX	40	Strip, Connecting	4	040334
10	Machine Screw, Round Head, #8-32 x .5"	4	2574-RBN	41	Support, Left	2	040332-2BX
				42	Clamp, Contact	4	040331
11	Nut, Hex, #6-40	12	2011-BN	43	Contact, Carbon	4	030601-1
12	Contact, Back	4	040326-1DX	44	Machine Screw, Round Head, #6-40 x .5"	4	2826-RE
13	Contact, Front	4	040324-2AX				
14	Support, Finger	4	040323	45	Support, Right	2	040332-3BX
15	Block, Insulating	2	040321-7X	46	Support, Contact	4	040330
16	Plate, Insulating	2	040322	47	Plate, Top	1	040310-1A
17	Machine Screw, Round Head, #6-40 x .25"	8	2824-RE	48	Washer, Sealing	14	040307
				49	Washer, Beveled	40	023834
18	Washer, Spring Lock, M, #6	28	1804-MZ	50	Machine Screw, Flat Head, #10-32 x 1"	4	2621-FBN
19	Machine Screw, Round Head, #6-40 x .875"	4	2821-RE				
				51	Nut, Clamp	4	023832
20	Spring, Compression	1	040384-1	52	Machine Screw, Round Head, #10-32 x .75"	4	2619-RBN
21	Cup, Spring	1	040380				
22	Support, Spring	1	040381	53	Post, Short	4	040306-B
23	Machine Screw, Round Head, #8-32 x .375"	2	2572-RBN	54	Post, Medium	4	040306-1B
				55	Post, Long	4	040306-2B
24	Screw, Stop	1	040318	56	Stack, Rectifier	1	040387-AYX
25	Nut, Machine, #10-32	1	2015-BN	57	Machine Screw, Round Head, #14-24 x .5"	1	2838
26	Washer, Spring Lock, M, #10	1	1806-MZ				
27	Pin, Stop	1	040335	58	Nut, Binding	28	023831
28	Armature	1	040315-1A	59	Washer, Insulating	2	040371
29	Machine Screw, Round Head, #8-32 x .75"	2	2577-RBN	60	Washer, Cork	4	040524-A
				61	Coil, Relay, 75 Ohm	2	040372-8X
30	Washer, Spring Lock, M, #8	10	1805-MZ	62	Yoke, Relay	1	040313-1A
31	Pin, Cotter, 1/16" x .5"	1	1000-E	63	Cap Screw, Hex Head, 5/16"-18 x .75"	2	4044-HSN
32	Trunnion	1	040723-1				

POWER TRANSFER RELAY ASSEMBLY

6 FRONT AND BACK CONTACTS



POWER TRANSFER RELAY REPLACEMENT PARTS

6 FRONT AND BACK CONTACTS

To Order: Specify Description and Part Number

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Hanger, Wall	1	040364-2AX	32	Sleeve, Adjusting	2	040320
2	Spring	4	040739	33	Core	2	040314-A
3	Post, Corner	4	040302-B	34	Nut, Machine, #14-24	18	040759
4	Washer, Post	4	040303-1	35	Washer, Spring Lock, M, 1/4"	18	1808-MZ
5	Washer, Cushion	4	040304-1	36	Machine Screw, Round Head, #6-40 x .5"	6	2826-RE
6	Shield	1	040301-4				
7	Gasket	1	040305-1	37	Nut, Machine, #10-32	2	040758
8	Ventilator	1	040506	38	Strip, Connecting	6	040334
9	Contact, Back	6	040326-1DX	39	Support, Left	3	040332-2BX
10	Contact, Front	6	040324-2AX	40	Clamp, Contact	6	040331
11	Support, Finger	6	040323	41	Contact, Carbon	6	030601-1
12	Block, Insulating	2	040321-1	42	Support, Contact	6	040330
13	Plate, Insulating	2	040322-1	43	Post, Terminal	2	023833
14	Screw, Stop	1	040318	44	Plate, Top	1	040310-3
15	Nut, Machine, #10-32	1	2015-BN	45	Washer, Sealing	20	040307
16	Washer, Spring Lock, M, #10	3	1806-MZ	46	Washer, Beveled	52	023834
17	Armature	1	040315-4BX	47	Machine Screw, Round Head, #10-32 x .75"	4	2619-RBN
18	Holder, Spring	2	040380-1				
19	Spring, Compression	2	040384-1	48	Machine Screw, Flat Head, #10-32 x 1"	4	2621-FBN
20	Connector	6	040329-3BX				
21	Machine Screw, Round Head, #8-32 x .5"	8	2574-RBN	49	Nut, Clamp	4	023832
				50	Washer, Insulating	2	040371
22	Washer, Spring Lock, M, #8	12	1805-MZ	51	Coil, Relay, 75 Ohm	2	040372-8X
23	Washer, Spring Lock, M, #6	42	1804-MZ	52	Post, Short	6	040306-B
24	Machine Screw, Round Head, #6-40 x .25"	12	2824-RE	53	Post, Medium	6	040306-1B
				54	Post, Long	6	040306-2B
25	Machine Screw, Round Head, #8-32 x .75"	2	2577-RBN	55	Nut, Hex, #6-40	18	2011-BN
				56	Nut, Binding	40	023831
26	Machine Screw, Round Head, #6-40 x .875"	6	2821-RE	57	Machine Screw, Round Head, #14-24 x .5"	1	2838
27	Pin, Cotter, 1/16" x .5"	1	1000-E	58	Washer, Cork	4	040524-A
28	Trunnion	1	040723-1	59	Yoke, Relay	1	040313-1A
29	Bracket, Armature	1	040319	60	Cap Screw, Hex Head, 5/16"-18 x .75"	2	4044-HSN
30	Machine Screw, Round Head, #8-32 x .625"	2	2576-RBN				
				61	Stack, Rectifier	1	040387-AYX
31	Pin, Stop	1	040335	62	Support, Right	3	040332-3BX

ORDERING INFORMATION

To Order: Specify Description and Part Number

Description	Total Ohms	Maximum P.U. & W.V. Volts	Number of Contacts	Dimensions in Inches			Weight in Pounds	Part Number
				Height	Width	Length		
Model E-7 Power Transfer Relay	150	9.0	4	9.25	6.25	6.75	11	040300-47EX
Model E-7 Power Transfer Relay	150	9.0	6	9.25	7.5	6.75	12	040300-110EX

Note: Dimensions and weight are of relay complete with mounting bracket.

Section J

Safetran

RESISTORS

SECTION J

CONTENTS

Product	Subsection
Resistance Guide	J-Guide
Sealed Resistors	1
Resistance Units - Adjustable, Fixed	2
Resistance Units - Tap Type	3
Resistance Heating Units	4

GUIDE TO DETERMINING RESISTANCE REQUIRED FOR YOUR APPLICATION

1. If current and voltage of equipment are known, go to step 4.

2. If voltage and wattage of equipment are known:

3. Find current required for equipment using the following formula:

   $I = W/E$

   Where I = current in amps
   W = watts
   E = voltage

4. Find Total Resistance (Ohms) needed to drop voltage to desired level using the following formula:
   $R = E/I$

   $$\text{Total Resistance (Ohms)} = \frac{\text{(Battery Voltage)} - \text{(Desired Voltage at Equipment)}}{\text{(Current Required)}}$$

5. Now with the Total Current (Amps) determined from step 3, and the Total Resistance (Ohms) from step 4, the proper resistor can be selected from section J of your Safetran catalog.

6. Be sure rated current of resistor equals or exceeds current required by equipment.

EXAMPLE:

1. Four 10 volt, 18 watt bulbs are to be used on a signal, two of which are lit at any one time. Total watts used 36. Bulb voltage is 9.5 volts, supply voltage is 12 volts.

2. $I = W/E = 1 = 36/9.5$ or 3.78 amps

3. Total Resistance (Ohms) = 12-9.5/3.78 = .66 ohms

4. 3.78 amps, .66 ohms

Our suggestion for this example would be Type 602 Adjustable Resistor, Part Number 029602-2X, found on page J-2-2.

AAR WATTAGE:

The resistor wattage dissipation such that the surface temperature does not exceed surface temperature as stated in Manual Part 135, paragraph 8 for applicable type.

GUIDE TO DETERMINING NON-STANDARD RESISTANCE OR CURRENT VALUES REQUIRED FOR YOUR APPLICATION

When a single resistor will not carry the required amperage, or resistance values cannot be reached with one resistor to an acceptable tolerance, the following steps should be followed.

Follow the same 5 steps on the front page and continue as follows:

RESISTORS WIRED IN MULTIPLE

If amperage determined from step 3 is too high, two or more resistors wired in multiple will combine to accommodate the load as follows:

$$I^T = I_1 + I_2 + \text{etc.}$$

Where I^T = the Total Current (Amps) of the resistors wired in multiple and I_1 and I_2 are Current Values (Amps) of each resistor wired in multiple.

If resistance value cannot be selected from one resistor to a value acceptable, two or more resistors can be wired in multiple to do the job as follows:

$$R^T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} + \text{etc.}$$

Special Case
When $R_1 = R_2$ $\qquad R^T = \frac{R_1 + R_2}{4}$

Where R^T is the Total Resistance (Ohms) of the resistors wired in multiple and R_1 and R_2 are Resistance Values (Ohms) of each resistor used.

RESISTORS WIRED IN SERIES

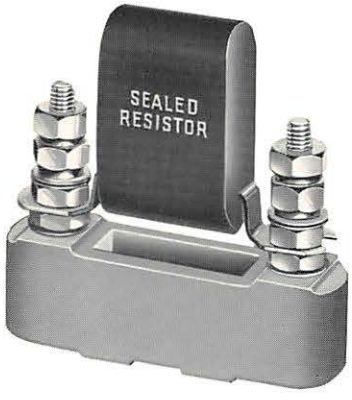
Resistors can be wired in series to obtain desired resistance values as follows:

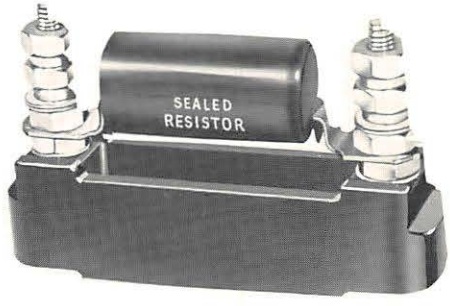
$$R^T = R_1 + R_2 + \text{etc.}$$

Where R^T is the Total Resistance (Ohms) of the resistors wired in series and R_1 and R_2 are Resistance Values (Ohms) of each resistor used.

The current carrying capabilities of resistors wired in *series* are equal to the resistor with the smallest amperage rating that is used.

SEALED RESISTORS





Sealed Resistors are made with alloy resistance wire wound on a porcelain core to which stainless steel terminal lugs are attached. A tight and permanent contact is assured by fastening the resistance wire to the terminal lugs with screws. This assembly is embedded in a thick wall of insulating ceramic cement which is contained within a steel casing and is sealed with a high grade insulating paint. These sealed resistors can be used as heating units within some signal equipment to prevent frost accumulation at vital points, such as commutators to contacts.

Safetran Sealed Resistors are noted in AAR Wattage, specified in Manual Part 135. Maximum temperature rise of hottest part of resistor body is 147° C (296° F) above ambient temperature.

The tolerances permitted in the rated resistances of the Sealed Resistors are:
Less than 50 Ohms, 5% above or below rated resistance.
50 Ohms or more, 10% above or below rated resistance.

RESISTOR ONLY

Resistance Ohms	Maximum Amperes	AAR Rating Watts	Dimensions in Inches				Part Number
			Mounting Centers	Height	Width	Length	
2.5	2.28	13	3.125	.875 Diameter		1.875	029245-79-2.5X
3	2.08	13	3.125	.875 Diameter		1.875	029245-79-3X
4	1.8	13	3.125	.875 Diameter		1.875	029245-79-4X
5	1.61	13	3.125	.875 Diameter		1.875	029245-79-5X
6	1.47	13	3.125	.875 Diameter		1.875	029245-79-6X
30	.66	13	3.125	.875 Diameter		1.875	029245-79-30X
50	.51	13	3.125	.875 Diameter		1.875	029245-79-50X
100	.36	13	3.125	.875 Diameter		1.875	029245-79-100X
Max. 2750	.06	10	2.375	.875 Diameter		1.25	029245-4X
Max. 5000	.06	18	2.375	2.00	.875	1.25	029245-26X
Max. 5500	.049	13	3.125	.875 Diameter		1.875	029245-5X
Max. 7650	.06	24	2.375	2.875	.875	1.25	029245-28X
Max. 10,000	.047	22	3.00	2.00	.875	1.875	029245-30X
Max. 13,500	.047	30	3.125	2.875	.875	1.875	029245-32X
Max. 15,000	.037	21	5.125	.875 Diameter		4.00	029245-6X
Max. 35,000	.034	41	5.125	3.00	.875	4.00	029245-20X
Max 50,000	.033	55	5.125	4.75	.875	4.00	029245-34X

RESISTOR MOUNTED ON PORCELAIN BASE

Resistance Ohms	Maximum Amperes	AAR Rating Watts	Dimensions in Inches			Part Number
			Height	Width	Length	
Max. 2750	.06	10	2.5	1.0	3.375	029245-1X
Max. 5000	.06	18	4.25	1.0	3.375	029245-25X
Max. 7650	.06	24	4.25	1.0	3.375	029245-27X
Max. 15,000	.037	21	2.5	1.0	6.125	029245-3X
Max. 35,000	.034	41	4.625	1.0	6.125	029245-21X
Max 50,000	.033	55	6.375	1.0	6.125	029245-33X

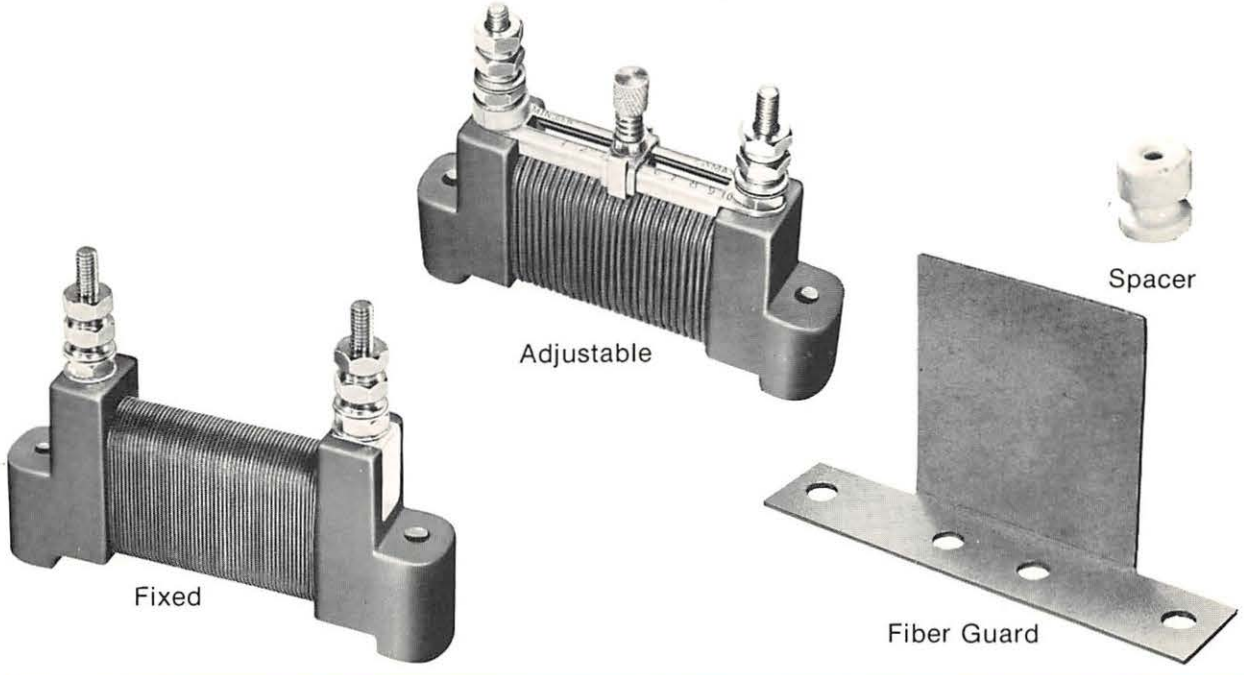
RESISTOR MOUNTED ON BAKELITE BASE

Resistance Ohms	Maximum Amperes	AAR Rating Watts	Dimensions in Inches			Part Number
			Height	Width	Length	
2.5	2.28	13	2.5	1.0	4.125	029245-82X
3	2.08	13	2.5	1.0	4.125	029245-94X
4	1.8	13	2.5	1.0	4.125	029245-95X
5	1.61	13	2.5	1.0	4.125	029245-96X
6	1.47	13	2.5	1.0	4.125	029245-97X
30	.66	13	2.5	1.0	4.125	029245-98X
50	.51	13	2.5	1.0	4.125	029245-99X
100	.36	13	2.5	1.0	4.125	029245-100X
Max. 2750	.06	10	2.5	1.0	3.375	029245-76X
Max. 5000	.06	18	4.25	1.0	3.375	029245-77X
Max. 5500	.049	13	2.5	1.0	4.125	029245-83X
Max. 7650	.06	24	4.25	1.0	3.375	029245-78X
Max. 10,000	.047	22	3.375	1.0	4.125	029245-84X
Max. 13,500	.047	30	4.25	1.0	4.125	029245-85X

Safetran

RESISTANCE UNITS

ADJUSTABLE, FIXED



Safetran Adjustable Resistance Units are of the slide type with resistance graduations.

The resistance wire, made of a corrosion resistant alloy, is uniformly wound around a porcelain base made with individual grooves for each turn of the wire. The wire is attached to the double-ended posts by means of a washer and two nuts within the block.

A stainless steel channel type bridge, used to insure against bowing and consequent loss of contact pressure, is marked in ten equal divisions of the total range of adjustment to facilitate settings and recording of critical circuits. The bridge is marked with minimum and maximum resistances as well.

The stainless steel contact assembly has two stainless steel springs, one of which is mounted between the sliding member and the double contact, and keeps pressure on the contact such that the circuit is always closed under spring pressure while making adjustment.

A knurled screw passes through both springs to exert direct pressure on the double contact to lock the sliding assembly in place on the bridge.

Safetran Fixed Resistance Units employ the same materials and construction as used in the adjustable types. A metal tag attached to one post gives specifications of the unit.

Both types of resistance units have AAR rating of 15 watts with a maximum resistance tolerance of ± 5%. They measure 3-3/4 inches high, 1 inch wide, and 5 inches long with mounting centers of 4-1/4 inches. Two #10 x 1.75 inch wood screws are furnished for mounting.

A fiber guard for protection against touching of adjacent units, and a spacer for use where excessive heating occurs are available.

Safetran Adjustable and Fixed Resistance Units are noted in AAR Wattage, specified in Manual Part 135. Maximum temperature rise of hottest part of resistor body is 55° C (131° F) above ambient temperature.

ORDERING INFORMATION

To Order: Specify Resistance Unit Type, Description, and Part Number.

ADJUSTABLE RESISTANCE UNITS

Description			Part Number
Maximum Ohms	Minimum Ohms	Maximum Amperes	
.63	.068	4.88	029602-1X
.7	.017	4.63	029602-51X
.8	.085	3.97	029602-2X
.8	.085	3.97	029602-9X *
1.0	.106	3.87	029602-3X
1.3	.136	3.40	029602-4X
1.5	.035	3.16	029602-52X
1.6	.172	3.06	029602-5X
2	.213	2.74	029602-6X
2.5	.270	2.45	029602-7X
3	.340	2.24	029602-8X *
3	.340	2.24	029602-8AX
4	.38	1.94	029603-1X
5	.482	1.73	029603-2X
6	.44	1.58	029603-22X
6.3	.605	1.54	029603-3X
7	.085	1.46	029603-51X
8	.77	1.37	029603-4X
10	.96	1.22	029603-5X
12.5	1.22	1.09	029603-6X
16	1.53	.97	029603-7X
17	1.70	.94	029603-8X
20	1.48	.87	029603-23X
22	2.12	.83	029603-9X
28	2.68	.73	029603-10X
35	3.37	.65	029603-11X
44	4.27	.58	029603-12X
56	5.4	.52	029603-13X
70	6.75	.46	029603-14X
87	8.5	.42	029603-15X
111	10.8	.37	029603-16X
221	16.5	.26	029603-25X
300	22.2	.22	029603-26X
Fiber Guard			029602-37
Porcelain Spacer			029605

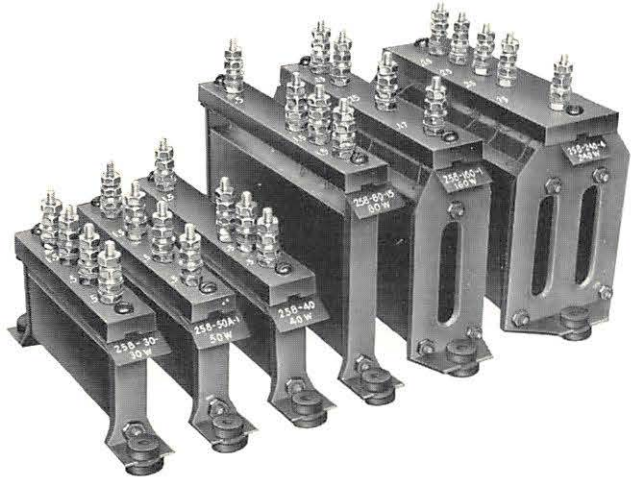
*Resistance Unit assembled with Equalizer Unit mounted on post.

FIXED RESISTANCE UNITS

Description		Part Number
Resistance Ohms	Maximum Amperes	
.19	8.89	029604-1X
.5	5.48	029604-2X
1	3.87	029604-3X
1.2	3.54	029604-4X
2	2.74	029604-5X
2.5	2.45	029604-6X
3	2.24	029604-7X
3.5	2.07	029604-10X
6	1.58	029604-8X
8.3	1.34	029604-9X
Fiber Guard		029602-37
Porcelain Spacer		029605

Safetran

RESISTANCE UNITS
ADJUSTABLE TAP TYPE



- HIGH CURRENT CARRYING CAPABILITIES
- LARGE SURFACE FOR HEAT DISPERSION
- NON-CORROSIVE RESISTANCE WIRE

The Sealed Tap Type Resistors are for applications where high current carrying capacity is desired. These resistors have a large surface for heat dispersion. Each unit has taps, plainly marked at terminal posts, for selection of less than total resistance.

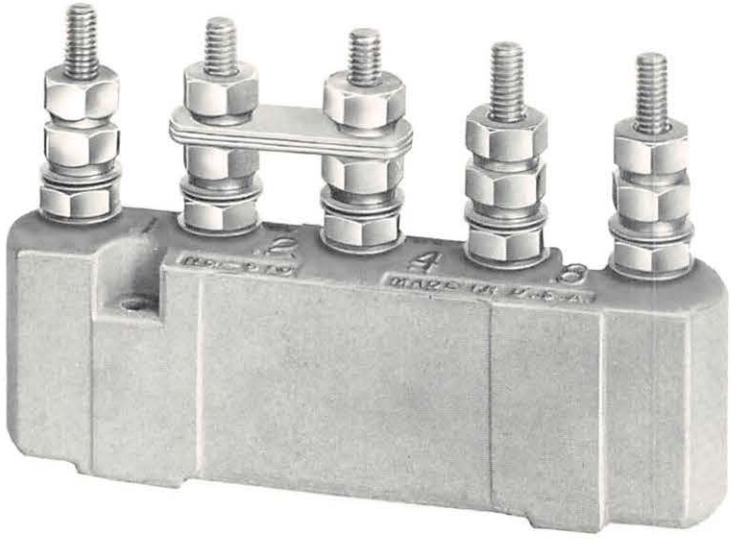
These resistance units are noted in AAR Wattage, specified in Manual Part 135. Maximum temperature rise of hottest part of resistor body is 147° C (296° F) above ambient temperature.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description							Dimensions in Inches				Part Number
Resistance in Ohms					Maximum Amperes	AAR Wattage Rating	Mtg. Ctrs.	H	W	L	
Total	Steps										
.4	.1	.25	.05		8.66	30	7	5	1.25	8	029258-30-1X
1.0	.1	.4	.2	.3	5.48	30	7	5	1.25	8	029258-30-30X
5.0	1.67	2.5	.83		2.45	30	7	5	1.25	8	029258-30-5X
20.0	5.	5.	10.		1.22	30	7	5	1.25	8	029258-30-9X
1.5	.5	.75	.25		5.16	40	9	5	1.25	10	029258-40-4X
2.5	1.5	.5	.5		4.00	40	9	5	1.25	10	029258-40-16X
2.5	1.5	.5	.5		4.47	50	8	5	1.25	9	029258-50-A1X
8.0	1.5	1.5	5.		2.50	50	8	5	1.25	9	029258-50-A2X
1.0	.17	.5	.33		8.94	80	9	7.25	1.25	10	029258-80-3X
1.5	.25	.75	.5		7.30	80	9	7.25	1.25	10	029258-80-4X
4.	1.0	2.5	.5		4.47	80	9	7.25	1.25	10	029258-80-29X
5.	1.67	2.5	.83		4.00	80	9	7.25	1.25	10	029258-80-11X
8.	5.	1.5	1.5		3.16	80	9	7.25	1.25	10	029258-80-15X
.5	.08	.25	.17		17.89	160	8.875	7.5	2.375	9.875	029258-160-1X
1.5	.25	.5	.75		10.33	160	8.875	7.5	2.375	9.875	029258-160-6X
.5	.17	.25	.08		21.91	240	8.875	7.5	3.875	9.875	029258-240-1X
1.0	.17	.5	.33		15.49	240	8.875	7.5	3.875	9.875	029258-240-2X
1.5	.25	.25	.25	.75	12.65	240	8.875	7.5	3.875	9.875	029258-240-4X

ADJUSTABLE TAP TYPE RESISTANCE UNITS



These Adjustable Tap Type Resistance Units are made on porcelain bases with AAR terminal posts spaced on one inch centers. Resistance coils are connected between posts. Connectors between posts short out resistance; the sum of the resistance values of the unshunted terminals is the resistance in use. In addition to resistance values shown, finer adjustment may be obtained by the use of external connections between posts to place resistor taps in multiple or series multiple. These resistance units measure 3 inches high, 1 inch wide, and 5 inches long, with mounting centers of 3 inches.

These resistance units are noted in AAR Wattage, specified in Manual Part 135. Maximum temperature rise of hottest part of resistor body is 147° C (296° F) above ambient temperature.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description							Part Number
Resistance in Ohms					Maximum Amperes	AAR Wattage Rating	
Total	Steps						
1.5	.1	.2	.4	.8	2.31	8	029810-2X
2.	.2	.3	.5	1.0	2.0	8	029810-3X
2.4	.2	.4	.6	1.2	1.83	8	029810-4X
2.4	.2	.4	.8	1.0	1.83	8	029810-4AX
15.	3.	3.	4.	5.	.73	8	029810-X
21.	3.	5.	6.	7.	.62	8	029810-8X
1.5	.1	.2	.4	.8	2.58	10	029810-1X
4.	1.0	1.0	1.0	1.0	1.94	10	029810-5X
8.	2.	2.	2.	2.	1.12	10	029810-6X
10.	1.0	2.	3.	4.	1.0	10	029810-7X

ADJUSTABLE TAP TYPE RESISTANCE UNITS

This Adjustable Tap Type Resistance Unit has six AAR binding posts mounted in a porcelain base. A high grade, non-corrosive resistance wire is wound in helical coils and fastened to post between the head of the post and nut. The bottom of this unit is enclosed with a porcelain plate. Connectors are provided for connection between the posts to obtain the desired resistance setting.

It measures 4-3/16 inches high, 3-1/6 inches wide, and 3-3/4 inches long.

These resistance units are noted in AAR Wattage, specified in Manual Part 135. Maximum temperature rise of hottest part of resistor body is 55° C (131° F) above ambient temperature.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description										
Resistance in Ohms								Maximum Amperes	AAR Wattage Rating	Part Number
Total	Steps									
2.5	.1	.2	.4	.8	1.0	—	—	2.61	17	029808-X

These Adjustable Tap Type Resistance Units have eight AAR binding posts mounted in a porcelain base. A high grade, non-corrosive resistance wire is wound in helical coils and fastened to post between the head of the post and nut. The bottom of this unit is enclosed with a porcelain plate. Connectors are provided for connection between the posts to obtain the desired resistance setting.

They measure 4-5/16 inches in diameter and are 4-3/4 inches high.

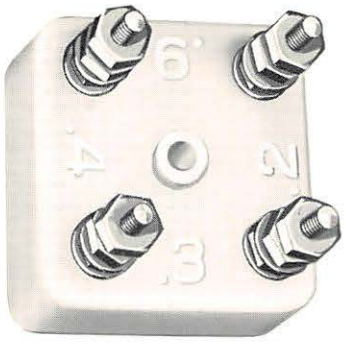
These resistance units are noted in AAR Wattage, specified in Manual Part 135. Maximum temperature rise of hottest part of resistor body is 55° C (131° F) above ambient temperature.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description										
Resistance in Ohms								Maximum Amperes	AAR Wattage Rating	Part Number
Total	Steps									
5	.1	.2	.3	.4	1.	1.	2.	1.79	16	029807-1X
10	.1	.2	.2	.5	1.	3.	5.	1.27	16	029807-2X
18.5	.5	1.	2.	2.5	2.5	3.	7.	.93	16	029807-5X

ADJUSTABLE TAP TYPE RESISTANCE UNITS



These Adjustable Tap Type Resistance Units have four AAR binding posts mounted in porcelain bases. A high grade, non-corrosive resistance wire is wound in helical coils and connected to posts between the head of the post and nut. They measure 2-9/16 inches square and 2-1/2 inches high.

These resistance units are noted in AAR Wattage, specified in Manual Part 135. Maximum temperature rise of hottest part of resistor body is 55° C (131° F) above ambient temperature.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description						Part Number
Resistance in Ohms				Maximum Amperes	AAR Wattage Rating	
Total	Steps					
.9	.2	.3	.4	2.79	7	029805-X
1.9	.4	.6	.9	1.92	7	029806-X

Safetran

RESISTANCE HEATING UNITS

- PREVENTS FROST ACCUMULATION
- PREVENTS CONGEALING OF LUBRICANTS
- PROVIDES DEPENDABLE HEAT

Resistance Heating Units are used to prevent collection of frost or congealing of lubricant in signal apparatus such as circuit controllers, switch machines, and gate mechanisms. They also may be located to prevent frost accumulation at vital points, such as commutators or contacts. These resistors have mounting centers of 6-1/8 inches.

Safetran Resistance Heating Units are noted in AAR Wattage, specified in Manual Part 135. Maximum temperature rise of hottest part of resistor body is 147° C (296° F) above ambient temperature.

ORDERING INFORMATION

To Order: Specify Description, Volts, Watts, Ohms, and Part Number.

Description	Volts AC or DC	Watts	Ohms	Dimensions in Inches			Part Number
				Height	Width	Length	
Resistance Heating Unit	110	25	484	1.375	1.375	7.5	029406-5X
Resistance Heating Unit	110	65	186	1.375	1.375	7.5	029406-2X
Resistance Heating Unit Mounted on Porcelain Base	110	65	186	3	1.375	7.5	029406-1X

Section K

Safetran

TRACK AND CIRCUIT HARDWARE

SECTION K

CONTENTS

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Track Test Shunts	4
Apparatus and Cable Termination Boxes — Pedestal Mounted	5
Padlocks	6
Tags and Marking Accessories	7

Safetran

TERMINALS, TERMINAL BLOCKS, AND HARDWARE

Safetran Universal Terminal Blocks consist of six or twelve AAR #10781 terminal posts, molded in bakelite phenolic on 1 inch centers in a strip 6 or 12 inches long, 2-1/2 inches high, and 1 inch wide.

The Multi-Unit Terminal Blocks consist of twelve AAR #10781 terminal posts molded in bakelite phenolic on 1-1/16 inch centers lengthwise, with each of the six sub-blocks having post centers of 1 inch. The Multi-Unit Block measures 6-3/8 inches long, 2-1/2 inches high, and 1-15/16 inches wide.

Both type blocks have binding washers (AAR #10708) and clamp nuts (AAR #10707) assembled on posts. Balance of nuts, washers, and binding nuts (AAR #10706) are furnished in separate plastic bag.

The Miniversal Terminal blocks consist of twelve AAR #10704 terminal posts molded in bakelite phenolic on 5/8 inch centers in a strip 7-1/2 inches long, 1-1/2 inches high, and 3/4 inches wide. Binding washers (AAR #10703) and clamp nuts (AAR #10702) are assembled on posts. Balance of nuts and washers are furnished in separate plastic bag.

Safetran Universal, Multi-Unit, and Miniversal terminal blocks are designed to provide protection against current leakage due to surface moisture. These blocks are easily cut into units of two blocks or more.

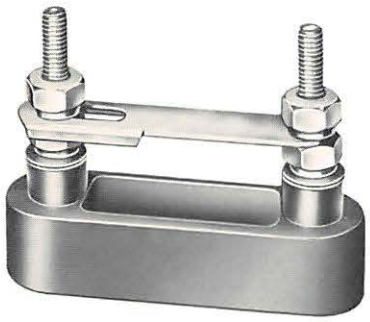
Safetran 13 Way and 14 Way Black Phenolic Terminal Blocks provide convenient terminal mounting on existing relay racks. For ordering information for terminal block hardware, see pg. K-1-6.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Center to Center Dimension of Terminal Posts In Inches	Part Number
Universal Terminal Block (12 Post)	1	023390-11X
Universal Terminal Block (6 Post)	1	023390-16X
Multi-Unit Terminal Block (12 Post)	1 on Sub-block 1-1/16 Lengthwise	023274-28X
Universal Terminal Block (12 Post)	5/8	023690-11X
13 Way Terminal Block (13 Post)	1-1/6 Vertical Spacing 1-3/8 Horizontal Spacing	051883-26
14 Way Terminal Block (14 Post)	1-1/6 Vertical Spacing 1-1/4 Horizontal Spacing	051883-18

TERMINAL BLOCKS



Bakelite Terminal Block

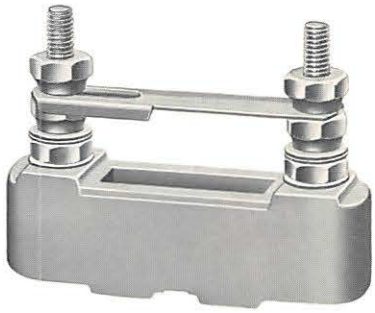
Model 612

Bakelite Terminal Block for Arresters, Equalizers, Resistance Units

Porcelain Terminal Block (1 inch centers)

Model 217

Porcelain Terminal Block (2-3/8 inch centers)



Porcelain Terminal Block (5-1/8 inch centers)

Safetran Terminal Blocks can be furnished in either Bakelite or porcelain construction. Bakelite terminal blocks have AAR #10781 terminal posts molded in bakelite base on 2-3/8 inch centers. Porcelain terminal blocks have AAR #10709 terminal posts mounted in grey unglazed procelain base on 1, 2-3/8, or 5-1/8 inch centers. These terminal blocks include 6 AAR #10708 beveled washers, 2 AAR #10707 clamp nuts, and 4 AAR #10706 binding nuts.

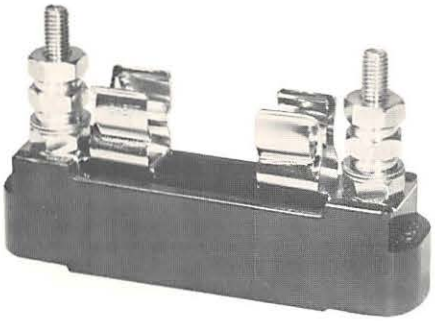
ORDERING INFORMATION

To Order: Specify Description and Part Number.

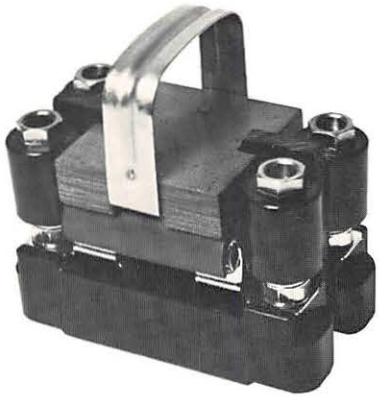
Description	Center to Center Dimension of Terminal Posts In Inches	Dimensions In Inches			Part Number
		Height	Width	Depth	
Bakelite Terminal Block*	2-3/8	2-7/16	3-11/32	31/32	023612-1X
Bakelite Terminal Block**	2-3/8	2-7/16	3-11/32	31/32	023612-5X
Porcelain Terminal Block	1	2-7/16	3-11/32	31/32	023217-12X
Porcelain Terminal Block	2-3/8	2-7/16	3-11/32	31/32	023217-13X
Porcelain Terminal Block	5-1/8	2-3/4	6-3/32	31/32	023217-3X

*Includes 4 AAR#10708 Beveled Washers and 4 AAR#10707 Clamp Nuts.
**Designed for mounting of Lightning Arresters, Equalizers, and Resistance Units.

FUSE BLOCKS

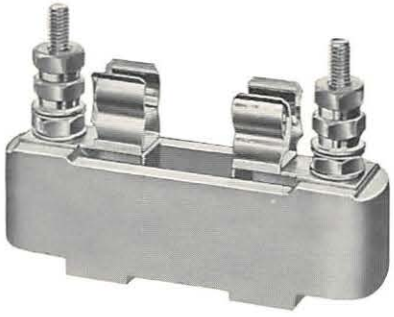


Model 614 Bakelite Fuse Block



Double Fuse Disconnect
(on Two Model 614 Fuse Blocks)

Single Fuse Disconnect
(on Model 614 Fuse Block)



Model 840 Porcelain Fuse Block

Model 841 Procelain Fuse Block

Safetran Model 614 Fuse Blocks are molded of high strength brown bakelite to provide a smooth finished product of excellent appearance and high quality. They are designed for fuses 2 inches in length with ferrules 9/16 inches in diameter.

The Model 840 and 841 Fuse Blocks are of grey unglazed porcelain. The Model 840 takes fuses 2 inches in length with ferrules 9/16 inches in diameter; whereas, the Model 841 is designed for fuses 5 inches in length with ferrules 13/16 inches in diameter.

Safetran single and double fuse disconnects are fuse holders with phenolic shields, that allow easy installation and removal of fuses.

All five models have heavy gauge nickel plated fuse clips seated and supported to prevent bending, deformity, and misalignment.

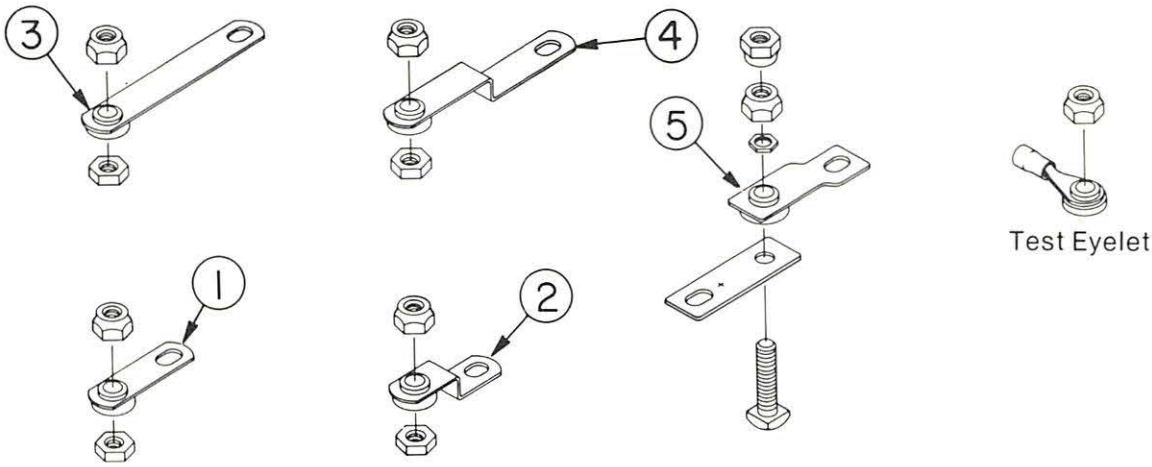
These fuse blocks include 6 AAR #10708 beveled washers, 2 AAR #10707 clamp nuts, and 4 AAR #10706 binding nuts.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Dimensions in Inches			Part Number
	Height	Width	Depth	
Model 614 Bakelite Fuse Block	2-7/16	1	4-1/8	027614-1X
Model 840 Porcelain Fuse Block	2-3/4	1	4-1/8	027840-X
Model 841 Porcelain Fuse Block	2-5/8	1-1/8	7	027841-X
Double Fuse Disconnect (Less Fuse)	2-5/8	2-1/8	2-1/8	025618-22X
Single Fuse Disconnect (Less Fuse)	1-1/2	2-1/8	7/8	025618-1X

INSULATED TEST LINKS AND TERMINALS



Safetran Insulated Testing Links are a practical and efficient insulated link for application to any two post terminal where open or closed circuit tests are required.

The Center Control Insulated Test Link allows open or closed circuit tests to be made without disturbing connections on either side of the circuit.

The Insulated Test Terminals also provide a convenient means to open or close a circuit for test purposes. Test Terminal Assemblies include a heavy duty signal eyelet fitted with an insulating bushing.

ORDERING INFORMATION

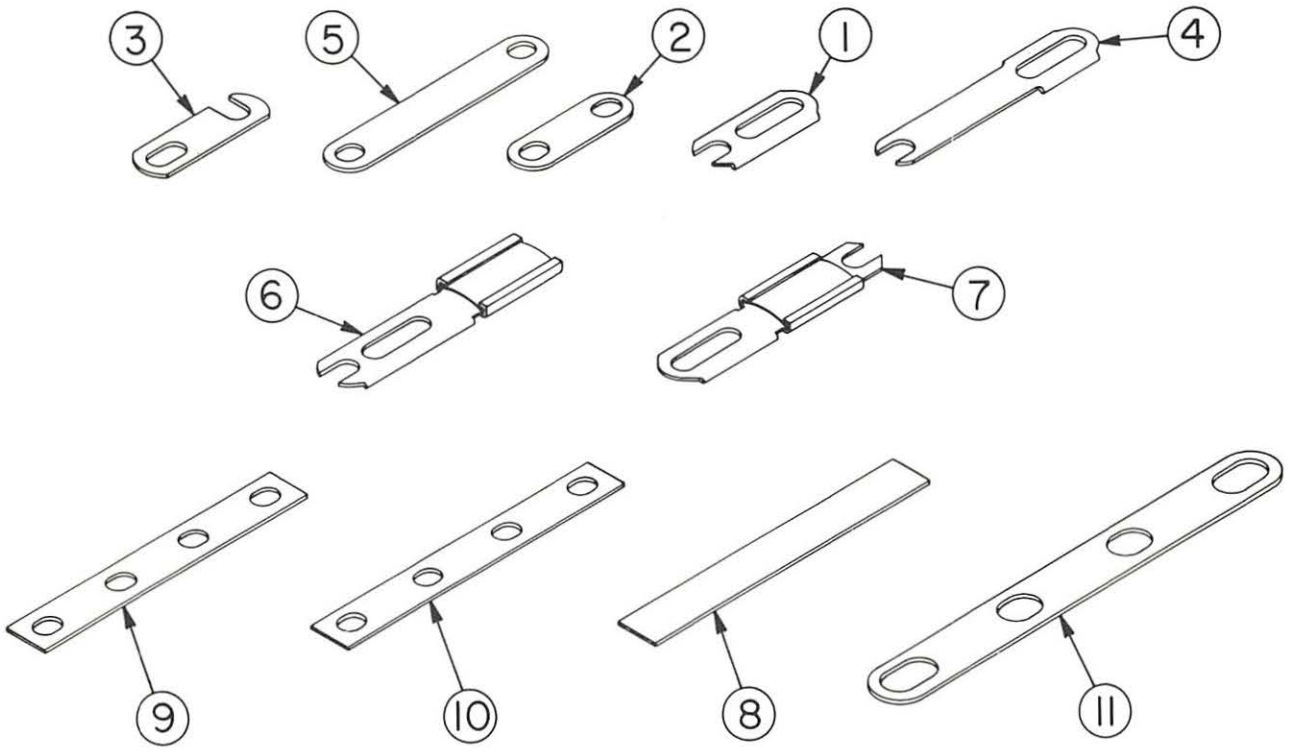
To Order: Specify Description and Part Number.

Item Number	Description	Mounting Center Dimension In Inches	Part Number
1	Straight Insulated Link w / special nut and clamp nut	1	024620-1X
	Straight Insulated Link w / special nut only	1	024620-2X
	Straight Insulated Link only	1	024620-3X
2	Offset Insulated Link w / special nut and clamp nut	1	024620-7X
	Offset Insulated Link w / special nut only	1	024620-11X
	Offset Insulated Link w / only	1	024620-19X
3	Straight Insulated Link w / special nut and clamp nut	2-3/8	024620-4X
	Straight Insulated Link w / special nut only	2-3/8	024620-5X
	Straight Insulated Link only	2-3/8	024620-6X
4	Offset Insulated Link w / special nut and clamp nut	2-3/8	024620-8X
	Offset Insulated Link w / special nut only	2-3/8	024620-12X
	Offset Insulated Link only	2-3/8	024620-20X
5	Center Control Insulated Test Link	2-3/8	024620-30X

To Order: Specify Insulated Test Eyelet and Part Number.

Post Size Diameter	Wire Size	Part Number			
		With Special Nut		Without Special Nut	
		Vinyl Insulation	Nylon Insulation	Vinyl Insulation	Nylon Insulation
1/4	22-18	024628-5X	024628-5NX	024628-108X	024628-108NX
1/4	16-14	024628-1X	024628-1NX	024628-3X	024628-3NX
1/4	12-10	024628-2X	024628-2NX	024628-4X	024628-4NX

TERMINAL AND BUSS CONNECTORS



Safetran Terminal Connectors and Buss Connectors are of bright nickel plated copper. They are available in a variety of lengths, with mounting centers ranging from 1 to 2-3/8 inches.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Item Number	Description	Center to Center Dimension of Terminal Posts In Inches	Part Number
1	Connector (AAR# 10761)	1	023837
2	Connector (AAR# 10763)	1	023839-2
3	Connector	1	023839-3
4	Connector (AAR# 10762)	2-3/8	023836
5	Connector (AAR# 10764)	2-3/8	023839-1
6	Connector, Tag	1	023827-X
7	Connector, Tag	2-3/8	023828-X
8*	Connector, Buss (AAR# 10765)	Without Holes	023839-4
9*	Connector, Buss (AAR# 10766)	1	023839-5
10*	Connector, Buss	1-1/16	023839-6
11	Connector, Buss	1-7/16—1-5/8	023839-21

*Specify length as required.

MISCELLANEOUS HARDWARE

Clamp Nut

Cup Terminal

Terminal Post

Insulated Nut

Beveled Washer

Shield and Cap

Binding Nut

Safetran Terminal Posts, Binding Nuts, and Clamp Nuts are nickel plated brass with 14-24 threads. The Beveled Washer is of nickel plated copper.

Safetran Cup Terminals provide a means of connecting the larger sizes of stranded wire to AAR terminal posts. It fully encloses the strands and provides increased bearing surface insuring a tight and reliable connection to any size wire up to No. 6. Its outside diameter of 3/4 inch allows sufficient clearance when used on 1 inch centers.

Safetran Insulated Nut consists of two brass hex nuts molded in Bakelite. The top nut is provided with AAR standard hex head for tightening with standard socket or wrench. The inside diameter of the top nut is considerably greater than the diameter of the terminal post so that no contact is possible between them.

Safetran Insulating Shield and Cap; also of Bakelite construction, are for use on terminal posts for circuits 110V and higher.

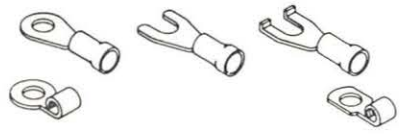
ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Washer, Beveled (AAR # 10708)	023834
Nut, Clamp (AAR # 10707)	023832
Nut, Binding (AAR # 10706)	023831
Terminal Post 2" (Complete assembly as shown)	023833-X
Terminal Post 2" (AAR # 10709)	023833
Terminal Post 1-5/8" (Complete assembly)	023833-X
Terminal Post 1-5/8"	023833-4
Terminal, Cup (for Standard #14-24 Terminal Post)	023289-5X
Terminal, Cup (for Shorter #14-24 Terminal Post)	023289-6X.
Terminal, Cup (for Standard 5/16" Terminal Post)	023289-10X
Nut, Insulated 1-3/16"	023408-1X
Nut, Insulated 1-1/16"	023408-23X
Shield and Cap, Bakelite (1-7/16" long with one 3/4" long wire slot)	023408-5X
Shield and Cap, Bakelite (1-1/8" long with one 1/2" long wire slot)	023408-6X
Shield and Cap, Bakelite (1-7/16" long with two 3/4" long wire slots)	023408-7X
Shield and Cap, Bakelite (1-1/8" long with two 1/2" long wire slots)	023408-8X

Note: Shield length of 1-7/16" long is used where the terminal post is raised above the top of the block (usually bakelite blocks).

SOLDERLESS TERMINALS AND LUGS

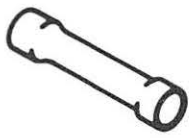


To Order: Specify Description and Part Number.

Description	Wire Size	Post Size	Part Number			
			Without Insulation	With Vinyl Insulation	With Nylon Insulation	With Flared Vinyl Insulation
Terminal, Ring	22-16	#6	024628-57	024628-53	024628-53N	024628-53F
Terminal, Ring	22-16	#8	024628-58	024628-54	024628-54N	024628-54F
Terminal, Ring	22-16	#10	024628-59	024628-55	024628-55N	024628-55F
Terminal, Ring	22-16	1/4″	024628-60	024628-56	024628-56N	024628-56F
Terminal, Ring	22-18	5/16″	024628-7A*	024628-7*	024628-7N*	024628-7F*
Terminal, Ring	20-16	#10	024628-29*	024628-19*	024628-19N*	024628-19F*
Terminal, Ring	20-16	#14	024628-28*	024628-18*	024628-18N*	024628-18F*
Terminal, Ring	16-14	#6	024628-65	024628-61	024628-61N	024628-61F
Terminal, Ring	16-14	#8	024628-66	024628-62	024628-62N	024628-62F
Terminal, Ring	16-14	#10	024628-67	024628-63	024628-63N	024628-63F
Terminal, Ring	16-14	1/4″	024628-68	024628-64	024628-64N	024628-64F
Terminal, Ring	16-14	1/4″	024628-26*	024628-16*	024628-16N*	024628-16F*
Terminal, Ring	16-14	5/16″	024628-24*	024628-14*	024628-14N*	024628-14F*
Terminal, Ring	12-10	#10	024628-73	024628-69	024628-69N	024628-69F
Terminal, Ring	12-10	1/4″	024628-27*	024628-17*	024628-17N*	024628-17F*
Terminal, Ring	12-10	1/4″		024628-17L		
Terminal, Ring	12-10	1/4″	024628-74	024628-70	024628-70N	024628-70F
Terminal, Ring	12-10	5/16″	024628-25*	024628-15	024628-15N	024628-15F
Terminal, Ring	8	1/4″	024628-75	024628-71	024628-71N	024628-71F
Terminal, Ring	6	1/4″	024628-76	024628-72	024628-72N	024628-72F
Terminal, Ring	6	5/16″	024628-76P	024628-72P	024628-72PN	024628-72PF
Terminal, Ring	6	7/16″	024628-107P	024628-107	024628-107N	024628-107F
Lug, Spade	22-16	#6	024628-80	024628-77	024628-77N	024628-77F
Lug, Spade	22-16	#8	024628-81	024628-78	024628-78N	024628-78F
Lug, Spade	22-16	#10	024628-82	024628-79	024628-79N	024628-79F
Lug, Spade	16-14	#6	024628-86	024628-83	024628-83N	024628-83F
Lug, Spade	16-14	#8	024628-87	024628-84	024628-84N	024628-84F
Lug, Spade	16-14	#10	024628-88	024628-85	024628-85N	024628-85F
Lug, Spade	12-10	#10	024628-90	024628-89	024628-89N	024628-89F
Lug, Flared Spade	22-16	#6	024628-94	024628-91	024628-91N	024628-91F
Lug, Flared Spade	22-16	#8	024628-95	024628-92	024628-92N	024628-92F
Lug, Flared Spade	22-16	#10	024628-96	024628-93	024628-93N	024628-93F
Lug, Flared Spade	16-14	#6	024628-100	024628-97	024628-97N	024628-97F
Lug, Flared Spade	16-14	#8	024628-101	024628-98	024628-98N	024628-98F
Lug, Flared Spade	16-14	#10	024628-102	024628-99	024628-99N	024628-99F
Lug, Flared Spade	12-10	#10	024628-104	024628-103	024628-103N	024628-103F
Terminal, Flag	18-14	1/4″	024628-20			
Terminal, Flag	12-9	1/4″	024628-21			
Terminal, Tag	16-14	#10	024628-32			

*Heavy Duty Signal Specials.

SOLDERLESS SPLICES AND TERMINATIONS



Butt

Parallel

Pigtail

To Order: Specify Description and Part Number.

Description	Wire Size	Part Number			
		Without Insulation	With Vinyl Insulation	With Nylon Insulation	With Flared Vinyl Insulation
Splice, Butt	22-16	024628-42	024628-43	024628-43N	024628-44
Splice, Butt	16-14	024628-45	024628-46	024628-46N	024628-47
Splice, Butt	12-10	024628-48	024628-49	024628-49N	024628-50
Splice, Parallel	22-16	024628-33	024628-34	024628-34N	024628-35
Splice, Parallel	16-14	024628-36	024628-37	024628-37N	024628-38
Splice, Parallel	12-10	024628-39	024628-40	024628-40N	024628-41
Pigtail, Nylon	22-14			024628-51N	
Pigtail, Nylon	18-10			024628-52N	

Safetran

BOOTLEGS

- CAST IRON CONSTRUCTION
- INSULATED ELECTRICAL CONNECTIONS
- AMPLE SPACE FOR SLACK WIRE
- BOTTOM AND SIDE CABLE OUTLETS

Safetran Bootlegs are designed to accept various sizes and combinations of cable conductors and track circuit connectors.

Two bronze cap screws secure the wires very tightly between the heavy tinned bronze clamps, resulting in an excellent connection which can be readily inspected.

The top castings are completely insulated to prevent grounding. Means are provided for supporting and sealing the cable within the head portion of the pedestal. Vibration or bending strains do not reach the cable. Ample space is allowed for slack wire which permits the addition of bootleg extensions when the track is raised. We recommend that considerable slack wire be left so that these bootleg extensions can be applied when necessary.

These cast iron bootlegs are available with a bottom, as well as side and bottom, cable outlets.

MODEL 445 BOOTLEGS

FOR SINGLE OR DOUBLE TRACK CIRCUIT CONNECTORS AND SINGLE CABLE CONDUCTOR

Model 445 Bootleg with bottom and side outlets.

Model 445 Bootleg with bottom outlet only.

To Order: Specify Model 445 Bootleg and Part Number.

Quantity and Maximum Diameter of Cable or Wire, Bootleg Will Accommodate					Overall Height of Assembly In Inches	Type Pedestal and Inside Diameter In Inches		Part Number
Cable Conductor			Track Circuit Connector					
Qty.	Diameter of Cable Conductor In Inches	Cable Entrance Hole Diameter In Inches	Qty.	Diameter of Track Connection In Inches		Bottom Outlet Only	Bottom & Side Outlet	
1	1/8	3/16	2	5/16	20-7/8		1-3/8	090445-57X
1	3/16	7/16	2	5/16	17	1-3/8		090445-1X
1	3/16	7/16	2	5/16	21-1/2	1-3/8		090445-2X
1	3/16	7/16	2	5/16	17		1-3/8	090445-27X
1	3/16	7/16	2	3/16	17		1-3/8	090445-64X
1	3/16	7/16	1	5/16	17		1-3/8	090445-66X
1	3/16	7/16	1	5/16	20-7/8		1-3/8	090445-92X
1	3/16	7/16	2	3/16	17	1-3/8		090445-3X
1	3/16	7/16	2	5/16	20-7/8		1-3/8	090445-56X
1	3/16	7/16	2	5/16	17	2		090445-31X

MODEL 435 BOOTLEGS

FOR SINGLE OR DOUBLE TRACK CIRCUIT CONNECTORS AND SINGLE CABLE CONDUCTOR

Model 435 Bootleg with bottom and side outlets.

Model 435 Bootleg with bottom outlet only.

To Order: Specify Model 435 Bootleg and Part Number.

Quantity and Maximum Diameter of Cable or Wire, Bootleg Will Accommodate					Overall Height of Assembly In Inches With Pedestal	Type Pedestal and Inside Diameter In Inches		Part Number	
Cable Conductor			Track Circuit Connector						
Qty.	Diameter of Cable Conductor In Inches	Cable Entrance Hole Dia. In Inches	Qty.	Diameter of Track Connection In Inches		Bottom Outlet Only	Bottom & Side Outlet	With Pedestal	Without Pedestal
1	1/8	9/64	2	5/16	17	1-1/2		090435-6X	090435-31X
1	1/8	9/64	2	5/16	18-1/2		1-1/2	090435-17X	090435-31X

MODELS 455 AND 563 BOOTLEGS

FOR ONE, TWO OR FOUR TRACK CIRCUIT CONNECTORS AND TWO OR FOUR CABLE CONDUCTORS

The Model 455 and 563 Bootlegs (2 way) will accomodate two or four cable conductors and two or four track circuit connectors. The clamps are well insulated from the bootleg cap and compression bolts. The cap itself is insulated from the pedestal.

The Model 455 and 563 are the same, with exceptions as indicated in table, and that the Model 455 has a greater pothead capacity. The Model 455 is recommended when four conductors are used or if slack wire is to be left in the pothead.

To Order: Specify Model 455 Bootleg and Part Number.

Quantity and Maximum Diameter of Cable or Wire, Bootleg Will Accommodate					Overall Height of Assembly In Inches With Pedestal	Pedestal With Bottom & Side Outlet Inside Diameter In Inches	Part Number	
Cable Conductor			Track Circuit Connector					
Qty.	Diameter of Cable Conductor In Inches	Cable Entrance Hole Diameter In Inches	Qty.	Diameter of Track Connection In Inches			With Pedestal	Without Pedestal
2	1/8	7/16	1	5/16	18-3/4	2-1/8	090455-1X	090455-23X
2	1/8	7/16	4	5/16	18-3/4	2-1/8	090455-2X	090455-24X
4	1/8	7/16	4	5/16	18-3/4	2-1/8	090455-17X	090455-25X

To Order: Specify Model 563 Bootleg and Part Number.

Quantity and Maximum Diameter of Cable or Wire, Bootleg Will Accommodate					Overall Height of Assembly In Inches With Pedestal	Pedestal With Bottom & Side Outlet Inside Diameter In Inches	Part Number
Cable Conductor			Track Circuit Connector				
Qty.	Diameter of Cable Conductor In Inches	Cable Entrance Hole Dia. In Inches	Qty.	Diameter of Track Connection In Inches			
1	1/8	7/16	2	5/16	19-1/8	2	090563-1X
2	1/8	7/16	4	5/16	19-1/8	2	090563-2X
4	1/8	7/16	4	5/16	19-1/8	2	090563-10X

MODEL 463 BOOTLEG

FOR CENTER OF TRACK APPLICATION

Safetran Model 463 Bootleg, also designed for center of track applications, consists of a cast iron box and pedestal with waterproof compression type connectors placed in the box so as to accomodate the required number and size of insulated track connections. Terminals or various types of wire connectors can be used inside the box. The riser box can be located in center of the track with the top slightly below the top of the ties.

The box measures 3-1/4 inches high, 4-1/8 inches wide, and 5-1/2 inches long. Overall height with series one pedestal, Part Number 093463-11, is 23-3/4 inches.

Any series one pedestal (see page K-6-2) may be substituted for the above pedestal.

For Model 463 Bootleg complete with two connectors; each to accomodate two track circuit connectors up to 5/16 inch diameter, order Part Number 091463-201X.

For Model 463 Bootleg complete with two connectors, each to accomodate one track circuit connector up to 5/16 inch diameter, order Part Number 091463-249X.

MODEL 338 FUSED TRACK BOOTLEG

FOR ELECTRIFIED RAILROADS

Safetran Model 338 Fused Track Bootleg is equipped with a Model 841 fuse block (see page K-1-3) to take standard cartridge type fuses 5 inches long with ferrules 13/16 inch in diameter. The bootleg will accomodate one track circuit connector (not furnished) which is gripped between composition blocks. The box is made with a recess for compounding the end of the cable insulation. The box measures 5 inches high, 5-3/4 inches wide, and 9-1/2 inches long. Overall height with pedestal is 20 inches.

For Model 338 Fused Track Bootleg, order Part Number 090338-10X.
For Model 338 Fused Track Bootleg, less pedestal, order Part Number 090338-12X.

MODEL 358 BOOTLEG HEAD

Safetran Model 358 Bootleg Head is designed for use on two inch pipe which can be cut and cast into concrete risers. The unit can also be mounted on the series five pedestal as pipe mount and base.
(see page K-6-2)

It is furnished with malleable iron castings which are insulated from each other by a fiber insulator and from the pipe by an insulating bushing. The assembled head is fastened to the pipe by a clamp. It is furnished with bronze clamps to accommodate one track connection on each side.

For Model 358 Bootleg Head, order Part Number 090358-6X.

BOOTLEG EXTENSIONS

Safetran Bootleg Extensions provide a convenient and inexpensive means for raising the caps of bootlegs without disturbing the cable or opening the circuit.

They are furnished in two parts, either two or three inches high, with necessary hardware. If desired, multiples can be used providing sufficient slack wire has been left in the pothead.

To Order: Specify Description and Part Number.

Description	Extension In Inches	Part Number
Bootleg Extension For Models 334, 335, 336, and 435	2	094460-6
Bootleg Extension For Models 334, 335, 336, and 435	3	094460-7
Bootleg Extension For Models 445 and 563	2	094460-8
Bootleg Extension For Models 445 and 563	3	094460-9

TRACK CIRCUIT HARDWARE

BOND STRAND, CLAMPS, PINS, RAIL CONNECTION PLUG

Bond Strand

Stranpins

Channel Pins

Rail Connection Plug

Safetran Bond Strand is for use with low voltage track circuit applications such as bootleg connections, fouling wires, shunts, bonding, and as a temporary connection in relocation of insulated joints.

Single and Double Entry Stranpins and Channel Pins, made of tin plated steel, are designed for use with Bond Strand. They permit quick, drive-in rail connections.

Also available for applications using Bond Strand is the Model RCP-10 Rail Connection Plug. Its construction consists of a seamless copper tube set in a steel plug which is silver soldered from the inside out. This construction reduces the possibility of shearing or cracking the shank upon installation, thereby providing a connection with a lesser possibility of developing high resistance. Because of this improved reliability, the Model RCP-10 is suggested for use with any rail connection carrying audio frequency type circuits.

BOND STRAND, PINS, RAIL CONNECTION PLUG ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
*Bond Strand, non-insulated,.200″ nominal diameter	021624-1
*Bond Strand, insulated, 1/16″ thick PVC jacket	021624-2
*Bond Strand, insulated, 3/32″ thick PVC jacket	021624-3
Stranpin, Single Entry, (Bond Strand enters one end)	021624-5X
Stranpin, Double Entry, (Bond Strand enters either end)	021624-6X
Channel Pin, Single (one 9/32″ diameter channel)	021624-14
Channel Pin, Duplex (two 3/8″ diameter channels)	021624-15
Model RCP-10 Rail Connection Plug	021127-4X

*Available in 50', 100', 500', or 1000' lengths.

TRACK CIRCUIT CLAMPS ORDERING INFORMATION

Support Clamp

Insulated Wire Clamp

Cable Keeper

Cable Support

Connector Clamp

Cable Clamp

Temporary Bond Clamp

Support Clamps are used to securely fasten Bond Strand to the web of the rail. Formed from galvanized sheet steel, each has a leaded steel rivet to be driven into 3/8 inch diameter hole. Support Clamps are available for one or two Bond Strand.

Safetran Insulated Wire Clamps are of high density black polyethelene. Nails or staples secure the clamps to the tie.

The Cable Keeper, fabricated from hot rolled steel with galvanized finish, is lagged to the top of the tie to keep track wires in place.

The Connector clamp tightly secures track circuit connectors between its two heavily tinned bronze clamps. The clamp will accept two wires of 3/16 to 1/4 inch diameter, or with outer clamping piece reversed, will grip a No. 6 wire. 3/8 inch diameter mounting hole required.

Safetran stainless steel Cable Clamp will hold two track wires; up to 5/8 inch diameter, in the web of the rail. 3/8 inch mounting hole required.

The Temporary Bond Clamp is used to maintain track circuits until permanent bonds can be installed. Chrome steel screws contact the rail base to insure the electrical connection. Bond Clamps can be furnished with either 3/8 inch diameter hole to accept stranpins or with AAR terminal post for jumper connection.

To Order: Specify Description and Part Number.

Description	Part Number	Description	Part Number
Support Clamp (for one Bond Strand)	021634-2X	Insulated Wire Clamp, 3/8″D, w/Base Insulation	021378-26X
Support Clamp (for two Bond Strands)	021634-1X	Insulated Wire Clamp, 1/4″D, w/o Base Insulation	021378-24X
Insulated Wire Clamp, 5/8″D, w/Base Insulation	021378-16X	Insulated Wire Clamp, 1/4″D, w/Base Insulation	021378-27X
Insulated Wire Clamp, 5/8″D, w/o Base Insulation	021378-15X	Cable Keeper	021515-11
Insulated Wire Clamp, 5/8″D, w/Base Insulation	021378-19X	Connector Clamp	021474-2X
Insulated Wire Clamp, 5/8″D, w/o Base Insulation	021378-21X	Cable Clamp	021515-1X
Insulated Wire Clamp, 5/8″D, w/Base Insulation	021378-22X	Temporary Bond Clamp (with 3/8 Inch Diameter Hole)	021388-1X
Insulated Wire Clamp, 3/8″D, w/o Base Insulation	021378-23X	Temporary Bond Clamp (with AAR Terminal Post)	021388-2X
Cable Support (for two 5/8" D. Cable)	021214-AYX		

Safetran

TRACK TEST SHUNTS

SUPER SHUNT, MODEL TS

Super Shunt

Model TS

- **OPEN CIRCUIT, ZERO RESISTANCE, AND .06 OHM SHUNTING**
- **PORTABLE, LIGHTWEIGHT CONSTRUCTION**
- **DESIGN ALLOWS FOR QUICK ATTACHMENT AND REMOVAL**

The Safetran Super Shunt is a portable track test shunt which combines greater ease in use with positive shunting. Toggle clamps are used for quick attachment or removal to either the base or head of rail. These clamps provide a positive grip with release lever for easy removal. Hardened steel points bite through rust and scale for better electrical contact. Jaws are adjustable to accomodate any size rail. Clamps of cadmium plated steel, conductors of #6 copper cable with neoprene jacket, and center block of compression molded high impact plastic allow the Super Shunt to withstand rugged field use. The center block contains a sealed .06 ohm resistor as well as two test links to provide open circuit, zero resistance, and .06 ohm shunting in the same unit.

The Model TS Track Shunts are special application shunts varying in testing and clamping abilities.

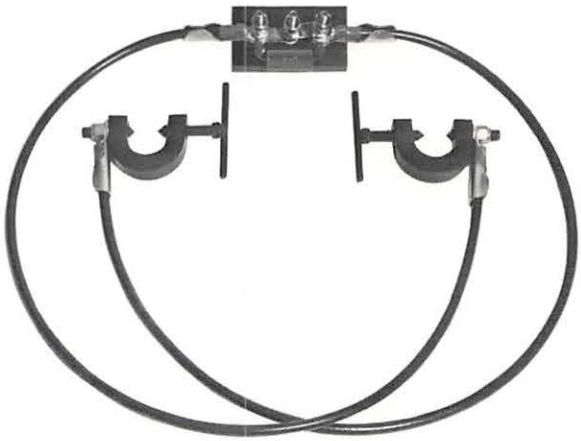
The Model TS1 (for base of rail clamping) and the Model TS1-B (for head of rail clamping) allow for zero resistance and .06 ohm shunting.

The Model TS2 (for base of rail clamping) and the Model TS2-B (for head of rail clamping) allow for zero resistance and open shunting.

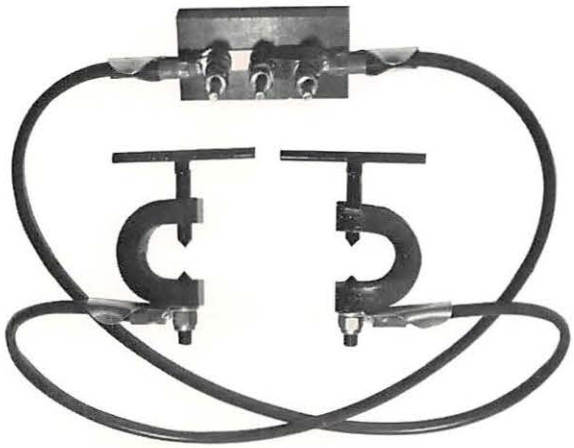
The Model TS3 (for base of rail clamping) and the Model TS3-B (for head of rail clamping) allow for zero resistance shunting.

TRACK TEST SHUNTS
ORDERING INFORMATION

Super Shunt



Models TS1, TS1-B



Models TS2, TS2-B

Models TS3, TS3-B

To Order: Specify Description and Part Number.

Description	Part Number
Super Shunt (open circuit, zero resistance, .06 ohm shunting)	021500-25X
TS1 Shunt (zero resistance, .06 ohm shunting for base of rail)	021500-5X
TS1-B Shunt (zero resistance, .06 ohm shunting for head of rail)	021500-6X
TS2 Shunt (open circuit, zero resistance shunting for base of rail)	021500-10X
TS2-B Shunt (open circuit, zero resistance shunting for head of rail)	021500-11X
TS3 Shunt (zero resistance shunting for base of rail)	021500-X
TS3-B Shunt (zero resistance shunting for head of rail)	021500-12X

APPARATUS AND CABLE TERMINATION BOXES

PEDESTAL MOUNTED

- **VARIETY OF BOXES AND PEDESTALS**
- **VARIETY OF ACCESSORIES AND EQUIPMENT AVAILABLE**
- **GASKET IN COVER PROVIDES WEATHER TIGHT SEAL**

These boxes have been adapted for pedestal mounting. They are available in a variety of sizes with several pedestal types, both constructed of cast iron.

The careful machining of these castings assure proper alignment of covers to housings. Gaskets are located between the cover and box to provide a weathertight seal.

Available for use with these boxes are a variety of connectors, adapter plates, outlets, ventilators, and lead knockouts.

Equipment to be used in these boxes, such as terminals, arresters, resistors, etc., may be found in their appropriate sections of this catalog.

Terminal boards of 3/4 inch wood, mounted in bottom of box, can be supplied for mounting of equipment.

A variety of adapter plates for use with air hose adapters and connectors are offered for use as wire entrances for switch circuit controllers and switch machines. Depending on the apparatus for which they are required, adapter plates are either steel or cast iron construction. Adapter plates may be furnished when the switch machine type and size of connector or air hose adapter is specified.

ORDERING INFORMATION

To Order, Specify the following:

1. Select box desired (see pages K-5-2 through K-5-5)
2. Select pedestal desired (see pages K-5-2 and K-5-3, match series)
3. Terminal board if desired
4. Accessories (see pages K-5-6 through K-5-8) and equipment required.
5. Openings required and their locations via illustrations. See exampie, page K-5-3.
6. Terminals required (see section K-1)

ORDERING INFORMATION
PEDESTALS

To Order: Specify Dimensions in Inches and Part Number.

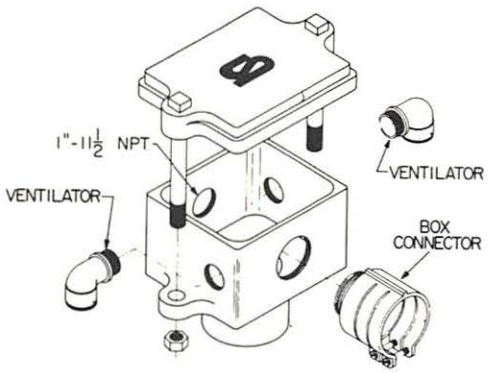
Series	Dimensions In Inches		Illustration Number	Part Number
	Height	I D		
One	14-1/2	2-1/2	Illustration 1	093313-7
One	14-1/2	2-1/2	Illustration 2	093313-22
One	20	2-1/2	Illustration 1	093463-11
One	20	2-1/2	Illustration 2	093463-89
One	30	2-1/2	Illustration 1	093463-23
Three	22	3-5/8	Illustration 3	093139-11
Four	14-1/2	3-1/8	Illustration 1	093374-4
Four	20-3/4	3-1/8	Illustration 1	093374-26
Four	26-3/4	3-1/8	Illustration 2	093374-27
Six	22	5	Illustration 4	093595-4
Pipe Mast*	Specify	2	Illustration 4	100175

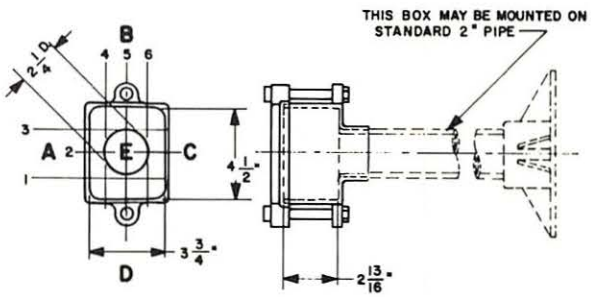
*To order Base for above Pipe Mast, order Part Number 093308-19X.

PEDESTAL MOUNTED BOXES

To Order: Specify Dimensions in Inches and Part Number.

Dimensions In Inches			Pedestal Application	Part Number
Width	Depth	Height		
4-1/2	3-3/4	2-13/16	Pipe Mast	091126-BX
5	3-5/8	2-13/16	Series One	091463-BX
5-3/8 Diameter		3	Series One	091313-BX
5-1/2	4-3/4	3-1/2	Series One	091626-BX
5-1/2	7-5/8	4-1/8	Series Four	091517-BX
7-1/2 Diameter		2-7/8	Series One	091470-BX
7-5/8	5-1/2	4-3/4	Series One	091584-BX
8-3/4	6	4-1/8	Series Four	091583-BX
8-3/4	6	4-1/8	Series Four	091483-BX
8-3/4	6	4-1/8	Series Two	091583-ABX
10	7	4	Series Four	091428-ABX
10	7	4	Series Four	091428-1ABX
10	7	4	Series Four	091428-CBX
10	7	4-1/2	Series One	091597-BX
10	10	5-1/2	Series Four	091608-BX
10	10	5-1/2	Series One	091608-ABX
12-1/2	8-1/2	5-1/4	Series Six	091595-BX





To order box as shown in example, the following data should be given on your order.
(1) Cable Termination Housing, Part Number 091126-BX, with tapped hole 1"-11-1/2 NPT at A-2.
(2) Box Connector, Part Number 7318, at C-2.
(3) Ventilators, Part Number 091313-15X, at B-4 and D-6.

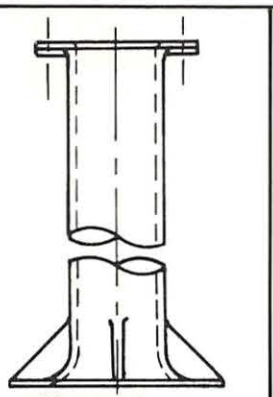


Illustration 1

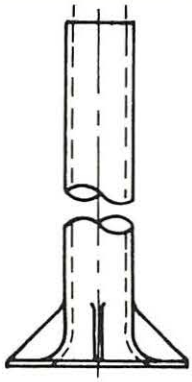


Illustration 2

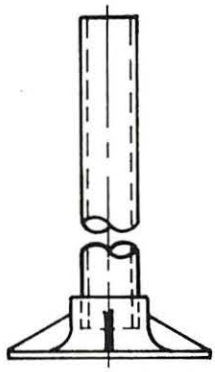


Illustration 3

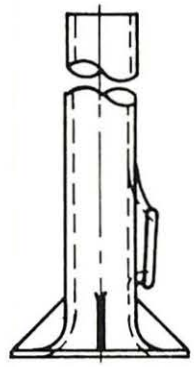
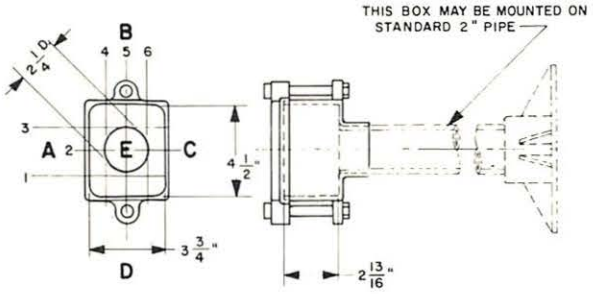
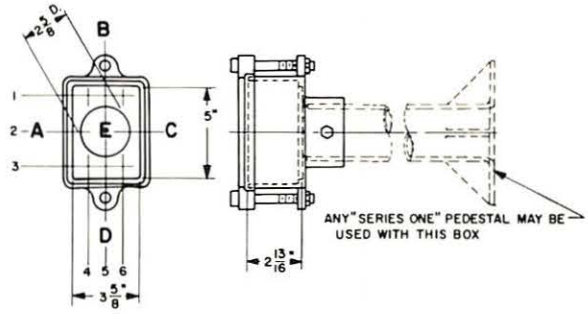


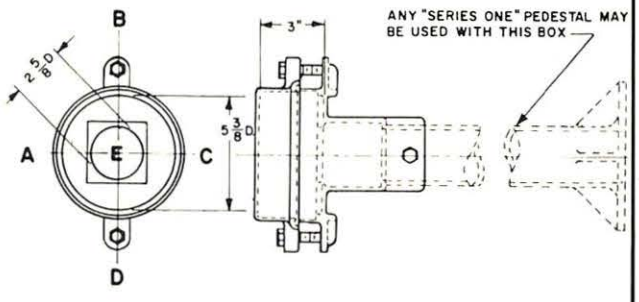
Illustration 4



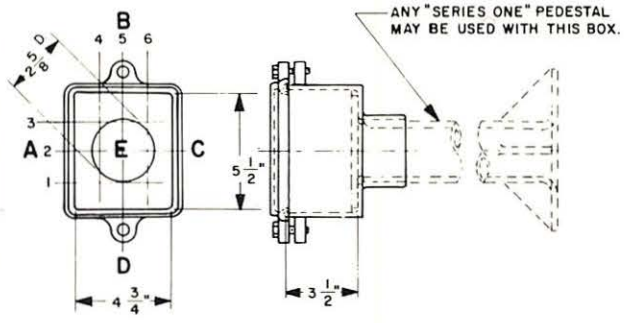
091126-BX



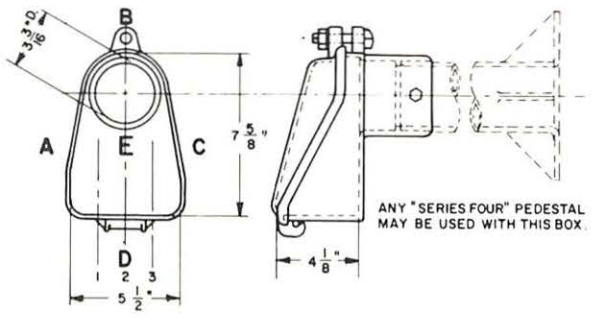
091463-BX



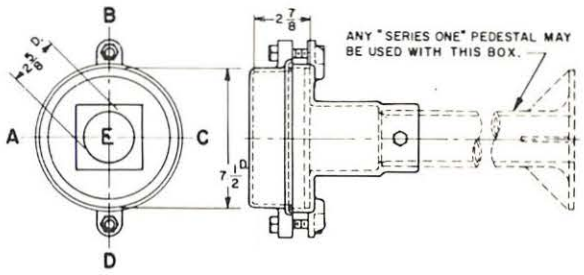
091313-BX



091626-BX



091517-BX



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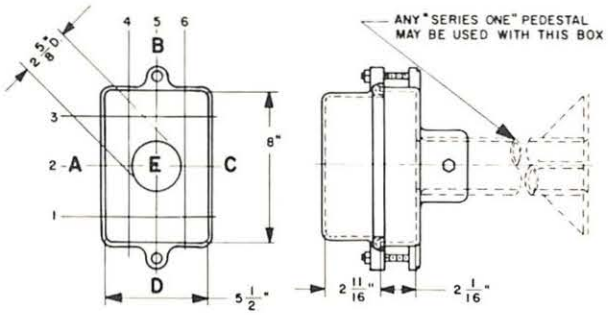

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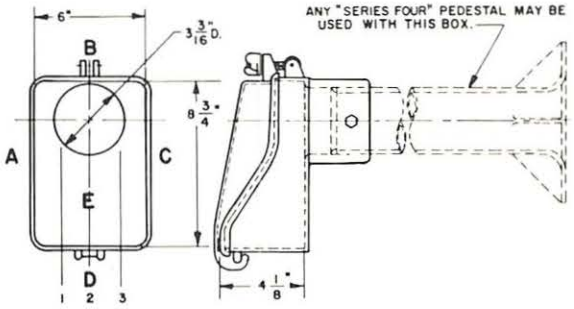

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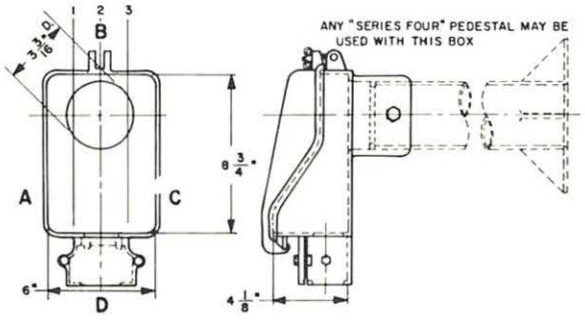

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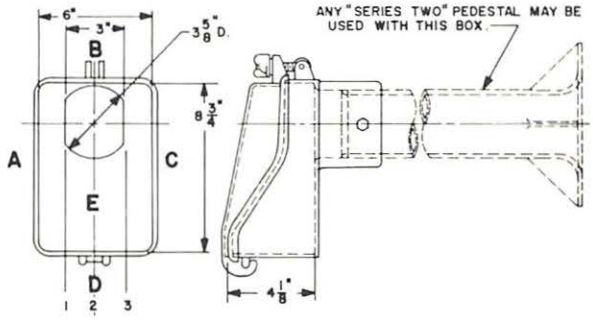

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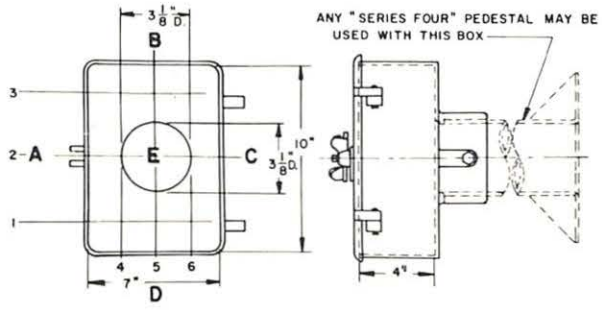

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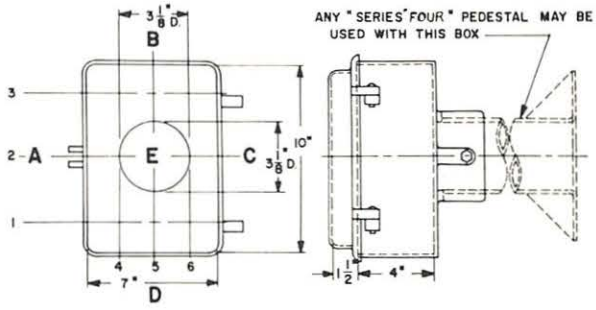

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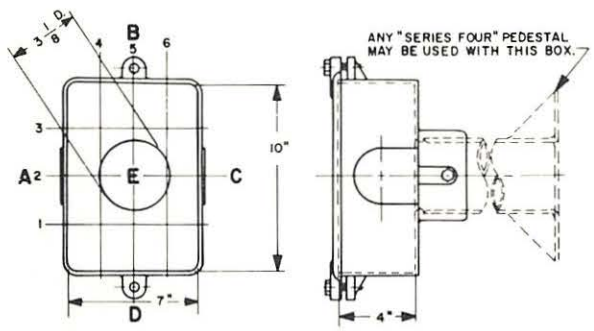

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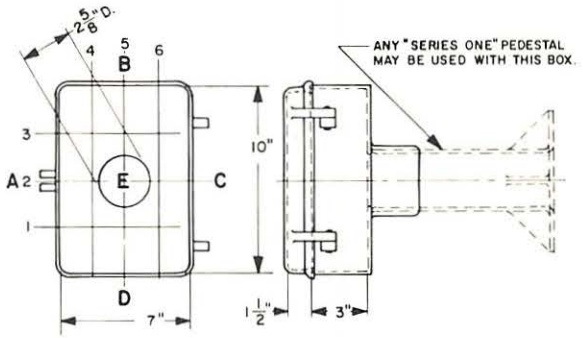

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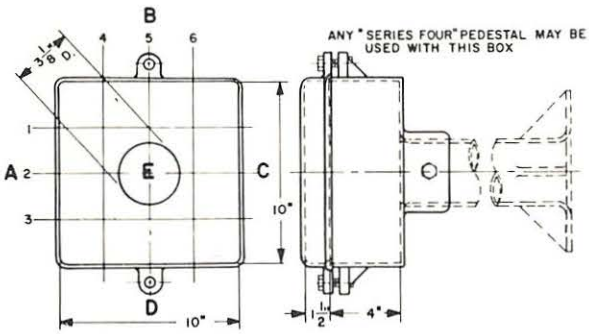
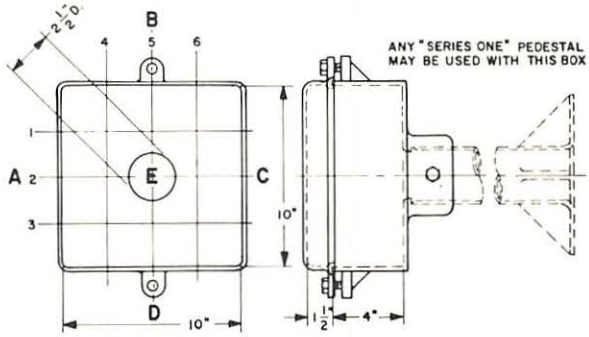


091608-BX



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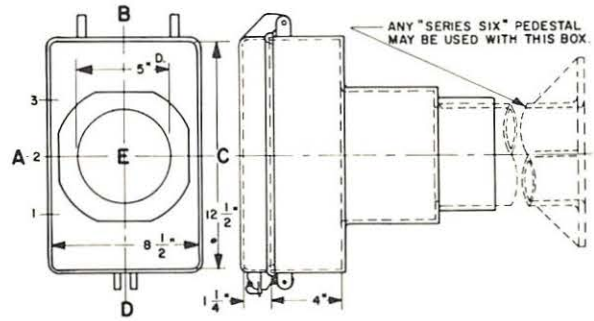
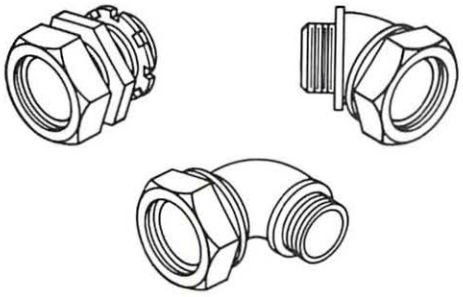


091595-BX

LIQUID AND OIL TIGHT CONDUIT AND CONNECTORS



Liquid and oil tight conduit and connectors provide a pratical and economical arrangement for the protection of wires between junction box and other track side equipment.

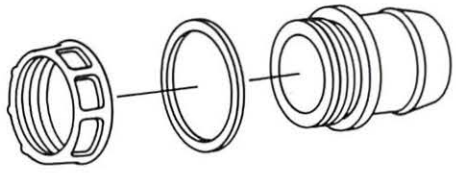
Connectors and conduit may be ordered in assemblies, or as individual parts from table below. When ordering conduit, specify length required.

ORDERING INFORMATION

To Order: Specify Conduit Size in Inches and Part Number.

Conduit Size In Inches	Part Number			
	Straight Connector	45° Connector	90° Connector	Conduit
3/8	7358	7358-45	7358-90	7271
1/2	7326	7326-45	7326-90	7270
3/4	7359	7359-45	7359-90	7264
1	7306	7306-45	7306-90	7262
1-1/4	7360	7360-45	7360-90	7252
1-1/2	7305	7305-45	7305-90	7253
2	7361	7361-45	7361-90	7267
2-1/2	7362	7362-45	7362-90	7268

AIR HOSE AND AIR HOSE ADAPTERS



Air hose adapters are cast iron construction, complete with bushing and sealing washer as shown.

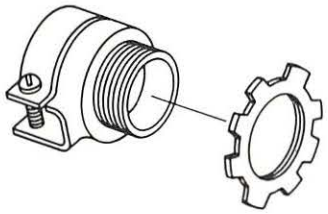
Air hose is of high quality 3 ply oil resistant material in sizes to fit adapters. When ordering air hose, specify length required.

ORDERING INFORMATION

To Order: Specify Inside Diameter of Hose and Part Number.

Inside Diameter of Hose In Inches	Mounting Thread Size In Inches	Part Number	
		Adapter	Air Hose
5/8	3/4—11	091463-14X	104448
3/4	3/4—14 NPT	091464-87X	104453
1	1—11-1/2 NPT	091464-82X	104452
1-3/8	1-1/2—11-1/2 NPT	091464-65X	104441
1-3/8	1-1/4—11-1/2 NPT	091464-94X	104441
1-1/2	1-1/2—11-1/2 NPT	091464-76X	104447
1-1/2	1-1/4—11-1/2 NPT	091464-62X	104447
1-7/8	1-1/4—11-1/2 NPT	091464-63X	104456
1-7/8	1-1/2—11-1/2 NPT	091464-90X	104456

FLEXIBLE METALLIC CONDUIT AND BOX CONNECTORS



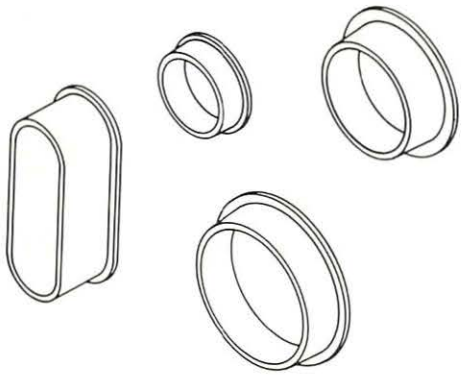
Box connectors are for use with Greenfield type flexible metallic conduit. Box connectors and flexible conduit may be ordered separately from the references below. When ordering flexible conduit, specify length required.

ORDERING INFORMATION

To Order: Specify Conduit Size in Inches and Part Number.

Conduit Size In Inches	Part Number	
	Box Connector	Flexible Conduit
.375	7335	7255
.500	7323	7259
.750	7317	7265
1.000	7324	7263
1.250	7320	7266
1.500	7318	7257
2.000	7319	7261
2.500	7355	7269

CAST LEAD KNOCKOUTS



Cast lead knockouts are used to plug drilled or tapped holes in cast boxes. Knockouts may be installed in a new box when drilled or tapped hole may be needed for future use.

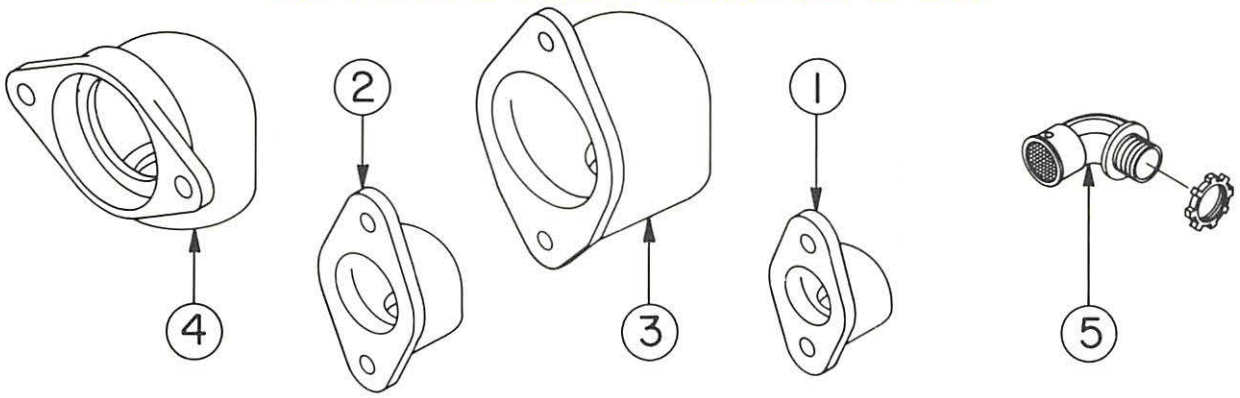
For Ordering Information, see top of next page.

ORDERING INFORMATION

To Order: Tapped or Drilled Hole Application and Part Number.

Maximum Grip In Inches	Tapped Hole Application In Inches	Drilled Hole Application In Inches	Part Number
5/16	1/2 NPT	3/4 Diameter	094538-9
5/16	3/4 NPT	27/32 Diameter	094538-8
5/16	1 NPT	1-1/16 Diameter	094538-7
5/16	1-1/4 NPT	1-5/16 Diameter	094538-3
5/16	1-1/2 NPT	1-11/16 Diameter	094538-5
5/16	——	1-15/16 Diameter	094538-4
5/16	2 NPT	2-7/16 Diameter	094538-2
9/16	2 NPT	2-7/16 Diameter	094538-6
5/8	2-1/2 NPT	3 Diameter	094538-12
9/16	3 NPT	3-1/2 Diameter	094538-10
1-1/16	——	4-1/8 x 1-9/16 Oblong	094538-1

OUTLETS AND VENTILATOR



Outlets (Items 1 and 2 listed below) include gaskets and mounting hardware for 5/16-18 tapped holes spaced at 2-11/32 inches and 3-3/16 inches respectively.

Outlets (Items 3 and 4 listed below) include gaskets, maple bushings, and mounting hardware for 3/8-16 tapped holes spaced at 4-1/8 inches.

Ventilator is designed for 7/8 diameter mounting.

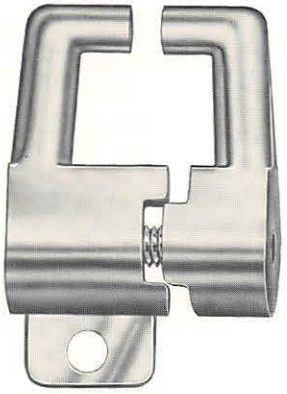
ORDERING INFORMATION

To Order: Specify Description and Part Number.

Item Number	Description	Inside Diameter In Inches	Part Number
1	Outlet	1-3/16	013001-9X
2	Outlet	1-3/8	013001-7X
3	Outlet	2	092494-23X
4	Outlet	2	092494-26X
5	Ventilator	——	091313-15X

Safetran

PADLOCKS



Zamak or Bronze

- VARIETY OF LOCK SCREW HEAD TYPES
- AVAILABLE IN STAINLESS STEEL, ZAMAK, OR BRONZE
- SIMPLE, YET STURDY CONSTRUCTION

Safetran Padlocks are of a simple, yet sturdy construction. These locks can be furnished in either Stainless Steel, Zamak, or Bronze with a variety of lock screw head types. Lock screw heads are available in the following types: hexagon, spanner, hexagon/spanner, standard triangle (11/32 inch in height), and small triangle (9/32 inch in height). The lock screw is designed to prevent lock from separating. Chains, when furnished, are brass and are fastened to the lock body, via a rivet. Chains will be furnished 10 inches long unless otherwise specified.

Keys for these locks are available for single or multiple application; dependent upon lock screw head type.

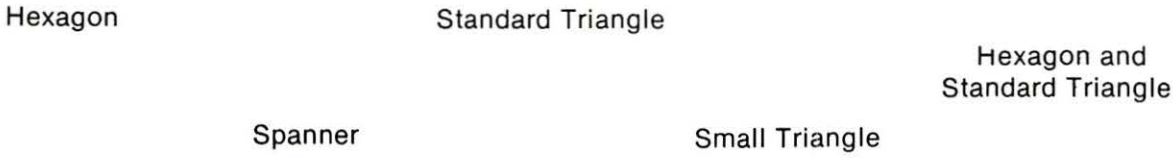
PADLOCKS
ORDERING INFORMATION

PADLOCKS

To Order: Specify Lock Screw Head Type and Part Number.

Lock Screw Head Type	Part Number				
	Zamak		Bronze		Stainless Steel
	With Chain	Without Chain	With Chain	Without Chain	Without Chain
Hexagon	030399-19X	030399-31X	030399-20X	030399-21X	030399-60X
Spanner	030399-26X	030399-22X	030399-28X	030399-33X	030399-64X
Hexagon/ Spanner	030399-24X	030399-16X	030399-51X	030399-29X	030399-63X
Standard Triangle	030399-X	030399-13X	030399-1X	030399-2X	030399-57X
Small Triangle	030399-15X	030399-14X	030399-17X	030399-18X	030399-62X

PADLOCK KEYS



To Order: Specify Description and Part Number.

Description	Lock Screw Heads On Which Key Is Used					Part Number
	⬡					
Key, Hexagon	X		X			030399-8
Key, Spanner		X	X			030399-10
Key, Standard Triangle				X		030399-7
Key, Small Triangle					X	030399-40
Key, Hexagon & Standard Triangle	X		X	X		030399-9

Safetran

MARKING TAGS

CLEARTAGS, FIBER, TERMINAL, LINE

Fiber Tag

Multi-Unit Cleartag

Single Unit Cleartag

Terminal and Line Tags

Safetran Single Unit and Multi-Unit Cleartags are transparent plastic with pocket to hold paper identification insert. The Single Unit Cleartags can be furnished with either nylon loops or brass pins for fastening to terminal boards or relay racks. Cleartag Sheets for Single Unit Cleartags include 100 perforated paper identification inserts which measure 1-1/4 inches long and 5/8 inch wide. The Multi-Unit Cleartags are furnished in strips of ten on one inch centers with 1/2 inch diameter wire hole. Cleartag Sheets for Multi-Unit Cleartags include 100 perforated paper identification inserts which measure 1 inch long and 13/16 inch wide.

Safetran Fiber Tags are of black or grey 1/16 inch thick vulcanized fiber. These tags can be varnished if desired, with either twine or nylon loops.

Safetran Vinyl Terminal Tags are of .020 inch thick white vinyl with 1/4 inch diameter hole to fit standard AAR terminal post.

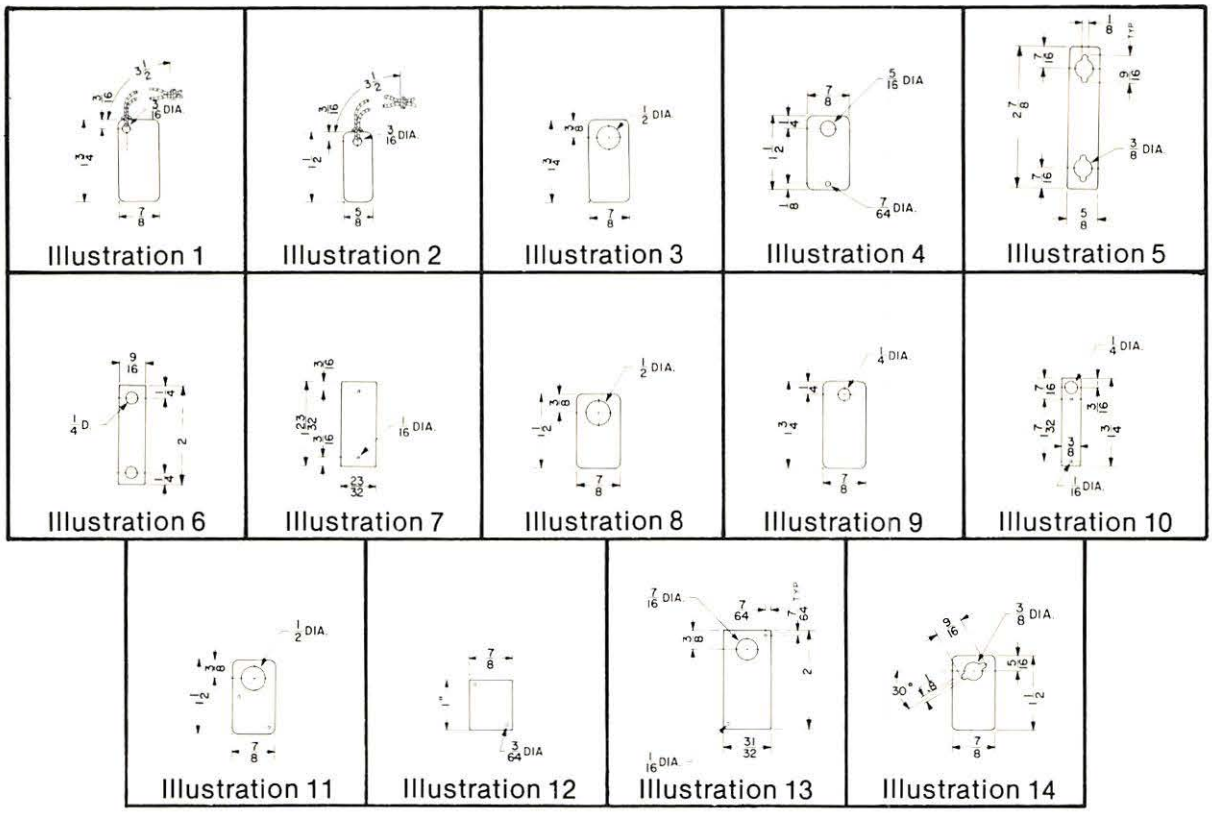
Aluminum Line Tags are of .050 inch aluminum. Designed to mark line wires, they may be easily stamped in the field with proper line nomenclature.

SINGLE AND MULTI-UNIT CLEARTAGS ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
1000 Single Unit Cleartags (with loops and 11 Cleartag Sheets)	024585-1X
1000 Single Unit Cleartags (with pins and 11 Cleartag Sheets)	024585-2X
1000 Single Unit Cleartags (with 11 Cleartag Sheets)	024585-3X
Cleartag Sheet for Single Unit Cleartags	024585-11
1000 Multi-Unit Cleartags (with pins and 11 Cleartag Sheets)	024585-16X
1000 Multi-Unit Cleartags (with 11 Cleartag Sheets)	024585-17X
Cleartag Sheet for Multi-Unit Cleartags	024585-15

FIBER TAGS
ORDERING INFORMATION

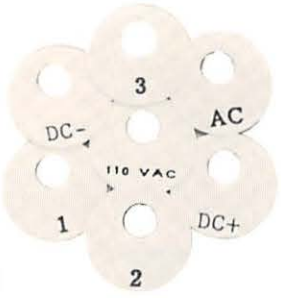


To Order, Specify the following:

1. Description and Part Number.
2. Varnish Coating if desired.
3. Nylon or Twine Loops on tags when applicable.
4. Black or Grey Fiber Tags.

Description	General Dimensions In Inches		Illustration Reference	Part Number
	Length	Width		
Fiber Tag (with loop)	1-3/4	7/8	Illus. 1	024359-6X
Fiber Tag (without loop)	1-3/4	7/8	Illus. 1	024359-2
Fiber Tag (with loop)	1-1/2	5/8	Illus. 2	024359-5X
Fiber Tag (without loop)	1-1/2	5/8	Illus. 2	024359-4
Fiber Tag	1-3/4	7/8	Illus. 3	024359-1
Fiber Tag	1-1/2	7/8	Illus. 4	024359-21
Fiber Tag	2-7/8	5/8	Illus. 5	024359-48
Fiber Tag	2	9/16	Illus. 6	024359-47
Fiber Tag	1-23/32	23/32	Illus. 7	024359-45
Fiber Tag	1-1/2	7/8	Illus. 8	024359-3
Fiber Tag	1-3/4	7/8	Illus. 9	024359-7
Fiber Tag	1-3/4	3/8	Illus. 10	024359-11
Fiber Tag	1-1/2	7/8	Illus. 11	024359-14
Fiber Tag	1	7/8	Illus. 12	024359-12
Fiber Tag	2	31/32	Illus. 13	024825
Fiber Tag	1-1/2	7/8	Illus. 14	024359-43

TERMINAL AND LINE TAGS ORDERING INFORMATION



Vinyl Terminal Tag

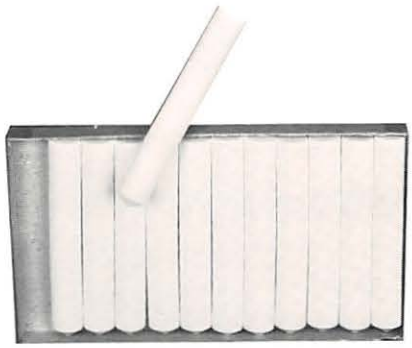
Aluminum Line Tag

To Order: Specify Description, Tag Marking, and Part Number.

Description	Tag Marking	Part Number
Vinyl Terminal Tag	AC	024359-25
Vinyl Terminal Tag	110 Vac	024359-26
Vinyl Terminal Tag	115 Vac	024359-27
Vinyl Terminal Tag	Common	024359-28
Vinyl Terminal Tag	DC+	024359-29
Vinyl Terminal Tag	DC—	024359-30
Vinyl Terminal Tag	—	024359-29A
Vinyl Terminal Tag	+	024359-30A
Vinyl Terminal Tag	1	024359-31
Vinyl Terminal Tag	2	024359-32
Vinyl Terminal Tag	3	024359-33
Vinyl Terminal Tag	4	024359-34
Vinyl Terminal Tag	5	024359-35
Vinyl Terminal Tag	6	024359-36
Vinyl Terminal Tag	7	024359-37
Vinyl Terminal Tag	8	024359-38
Vinyl Terminal Tag	9	024359-39
Vinyl Terminal Tag	10	024359-40
Vinyl Terminal Tag	11	024359-41
Vinyl Terminal Tag	12	024359-42
Vinyl Terminal Tag	13	024359-53
Vinyl Terminal Tag	14	024359-54
Vinyl Terminal Tag	15	024359-55
Vinyl Terminal Tag	16	024359-56
Vinyl Terminal Tag	17	024359-57
Vinyl Terminal Tag	18	024359-58
Vinyl Terminal Tag	19	024359-59
Vinyl Terminal Tag	20	024359-60
Vinyl Terminal Tag	21	024359-61
Vinyl Terminal Tag	22	024359-62
Vinyl Terminal Tag	23	024359-63
Vinyl Terminal Tag	24	024359-64
Vinyl Terminal Tag	25	024359-65
Aluminum Line Tag	—	024359-46

MARKING TAG ACCESSORIES ORDERING INFORMATION

Nylon Cord



Tag Filler

Twine

To Order: Specify Description and Part Number.

Description	Part Number
Cord, Nylon, 10 ply (1500 feet)	024359-19
Twine, 10 ply (1 pound spool)	024359-10
Filler, Tag (12 sticks)	024359-22
Loops, Nylon, 4″ (100 count)	024359-17X
Loops, Twine, 4″ (100 count)	024359-9X

Section L

Safetran

SWITCH AND PIPELINE HARDWARE

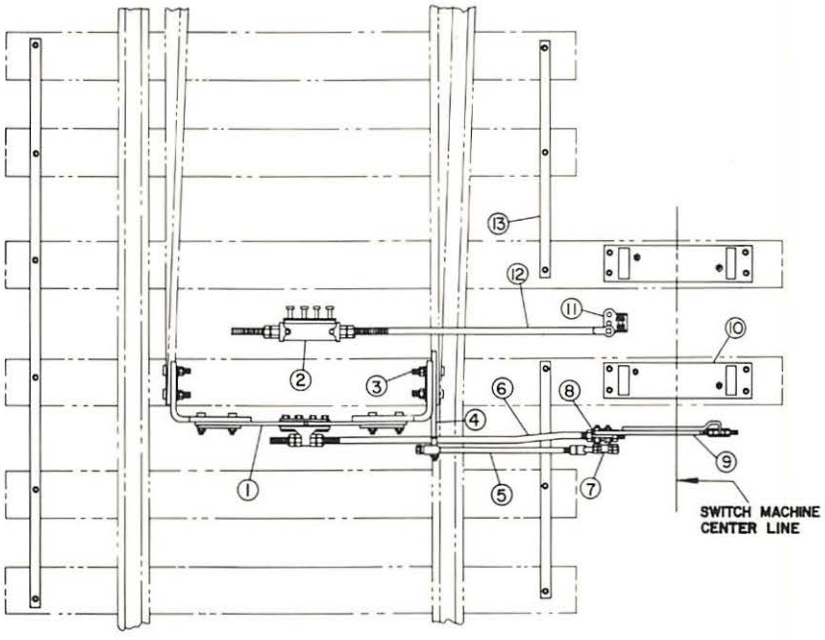
SECTION L

CONTENTS

Product	Subsection
Switch Layout Guide	L-Guide
Operating Rods	1
Lock Bars	2
Front Rods	3
Controller Rods	4
Switch Point Roller	5
Lugs	6
Pipeline Equipment	7

SWITCH LAYOUTS

GENERAL INFORMATION



TYPICAL SWITCH LAYOUT WITH SWITCH MACHINE

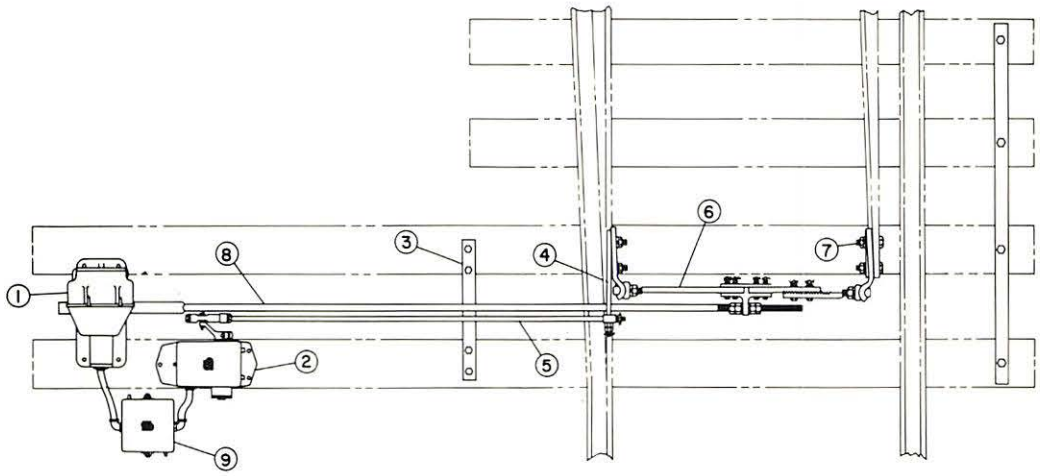
Safetran offers all components necessary for a switch layout. These layouts may include an electric switch machine or manual throw switch.

The above illustration shows a typical switch layout using an electric switch machine. Included in such a layout are: LOCK ROD, SWITCH ADJUSTING BRACKET, THROW BAR CONTACT COUPLING, FRONT ROD, CONNECTING LOCK BAR, LOCK BAR LUGS, LOCK BAR ASSEMBLY, DETECTOR ROD, DETECTOR LUGS, TRACK BOLTS, TIE STRAPS AND SADDLE PLATES.

Please refer to the chart below as a guide to locating switch lock layout components in this catalog. For items not found in this catalog, call factory with your specification.

ITEM NO.	DESCRIPTION	LOCATION
1	Switch Front Rod Assembly	L-3
2	Switch Adjustment Bracket	L-1
3	Track Bolt	L-3
4	Point Lugs	L-4
5	Detector Rod	Contact factory with specs
6	Lock Connecting Rod	L-2
7	Detector Lugs	Contact factory with specs
8	Lock Bar Lugs	L-6
9	Lock Bar Assembly	L-2
10	Saddle Plate	Contact factory with specs
11	Throw Bar Coupling	Contact factory with specs
12	Operating Rods	L-1
13	Tie Strap	Contact factory with specs

TYPICAL SWITCH LAYOUT USING MANUAL THROW-SWITCH



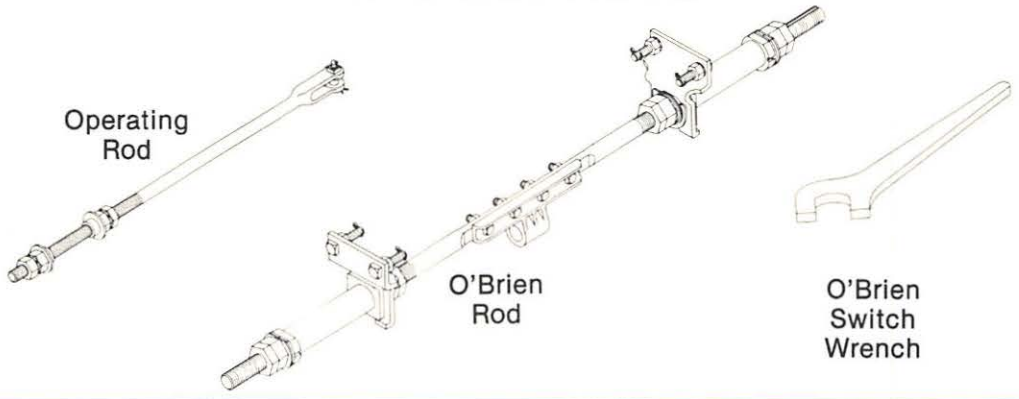
A switch layout using a manual throw switch generally requires a means of locking the switch in place and a means of point detection. Safetran offers ELECTRIC SWITCH LOCKS and SWITCH CIRCUIT CONTROLLERS for this purpose.

Please refer to the chart below as a guide to locating switch lock layout components in this catalog. For items not found in this catalog, call factory with your specification.

ITEM NO.	DESCRIPTION	LOCATION
1	Electric Switch Lock	D-11
2	Switch Circuit Controller	D-12
3	Tie Strap	Contact factory with specs
4	Point Lug	L-4
5	Detector Rod	Contact factory with specs
6	Switch Front Rod Assembly	L-3
7	Track Bolt	L-3
8	Lock Rod	L-2
9	Pedestal-Mounted Terminal Box	K-5

OPERATING RODS

OPERATING RODS, ADJUSTABLE LINKS, O'BRIEN RODS



Safetran Operating Rods are fabricated from hot rolled steel, available in any length with any offset(s) to meet your specific requirements. All rods are normalized before bending for added strength. All integral clevises are forged from the rod, whereas threaded jaws are steel castings.

Both have standard openings of 13/16 of an inch and are drilled for AAR #10105 jaw pin. The screw jaw used on the adjusting links is AAR #10164, also drilled for AAR #10105 jaw pin. Standard 1-1/4—7 round threads are used; they may constitute any desired length of the rod.

O'Brien Rods are designed for use with single slip and double slip crossings. Those available include: Head Rod for Switch Rails, Back Rod for Switch Rails, Head Rod for Movable Points, and an OB-2 Rod. These Rods are of steel construction with high grade phenolic insulating parts.

Threads are industry standard 1-3/4"—5 UNC-2A. All parts are black primer painted before assembly. A 1-3/4" switch adjusting wrench is available for use on the O'Brien Rod.

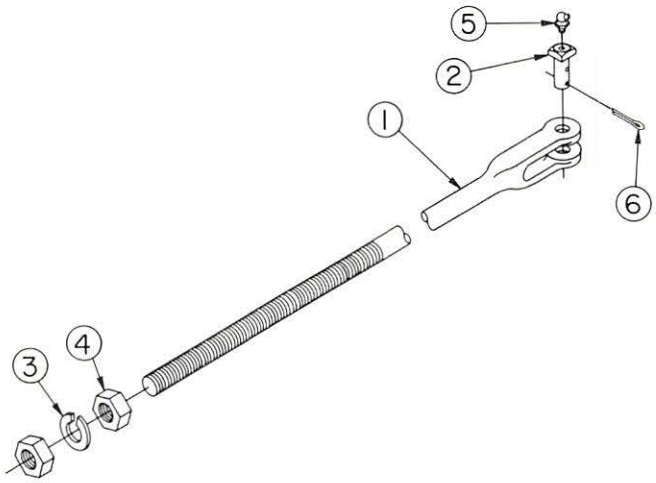
ORDERING INFORMATION

Operating Rods - Specify length of rod, length of rod to be threaded, and location and degree of offset(s). A drawing and/or complete specifications may be submitted with your order or inquiry.

O'Brien Rods - Specify Description and Part Number from table below.

Description	Length In Inches	Part Number
Dbl. Slip SW Head Rod For Switch Rails	126	110273-6X
Dbl. Slip SW Back Rod For Switch Rails	115	110273-3X
M.P. Frog Head Rod for Movable Points	85	110273-4X
OB-2 Rod	85	110273-5X
1-3/4" Switch Adjusting Wrench		032249-5

OPERATING ROD REPLACEMENT PARTS

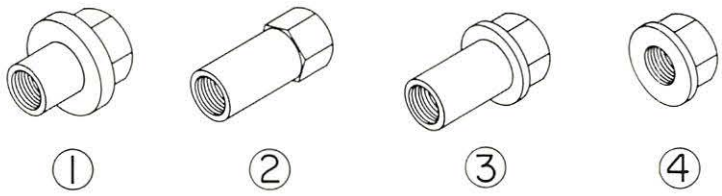


To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Rod, Operating	1	Specify*
2	Pin, Jaw, AAR #10105	1	110202
3	Washer, Spring Lock, M, 1-1/4"	1	1819-MS
4	Nut, Hex, 1-1/4"-7	2	2211-SC
5	Fitting, Alemite, 45°	1	110445-1
6	Pin, Cotter, 3/16" x 1.5"	1	1035-S

*For Operating Rod to be replaced, specify length of rod, length of rod to be threaded, and location and degree of offset(s). A drawing and/or complete specification may be submitted with your order or inquiry.

SLEEVE NUT ORDERING INFORMATION

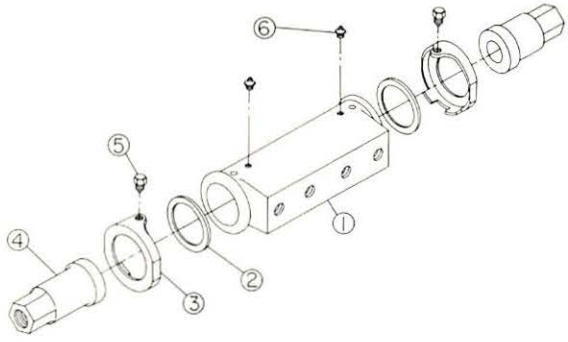


To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Sleeve Nut	110295-1
2	Sleeve Nut*	110295
3	Sleeve Nut*	110295-2
4	Jam Nut	110295-3

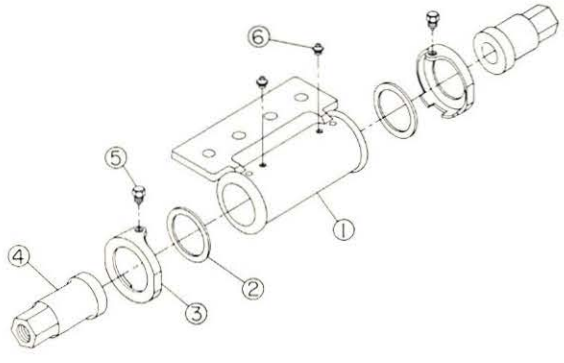
*Note. Item #4 must be ordered when ordering this part.

VERTICAL AND HORIZONTAL SWITCH ADJUSTMENT BRACKETS ORDERING INFORMATION



To Order: Specify Description and Part Number.

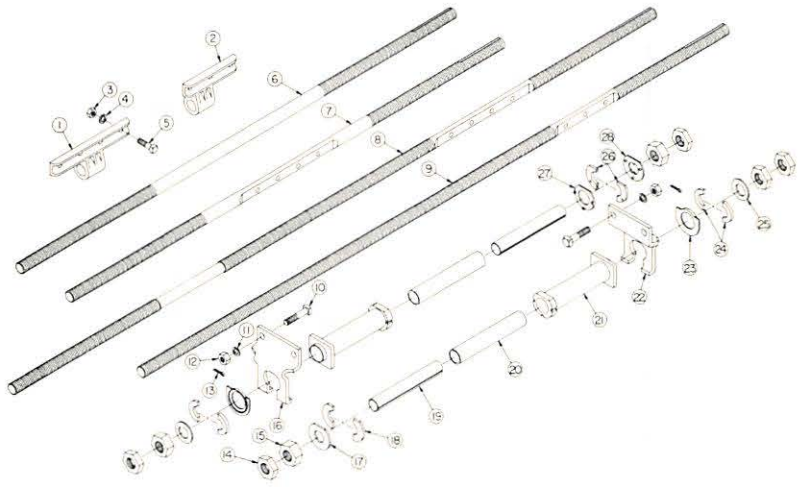
Item Number	Description	Quantity Required	Part Number
1	Bracket, Adjusting Vertical	1	110294-20
2	Gasket, Ring	2	110294-4
3	Cap, Bracket	2	110294-11
4	Bushing, Adjusting	2	110294-13
5	Screw, Cap	2	110294-5
6	Fitting, Grease	2	083510



To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Bracket, Switch Horizontal	1	110294-18
2	Gasket, Ring	2	110294-4
3	Cap, Bracket	2	110294-11
4	Bushing, Adjusting	2	110294-13
5	Screw, Cap	2	110294-5
6	Fitting, Grease	2	083510

O'BRIEN RODS
REPLACEMENT PARTS



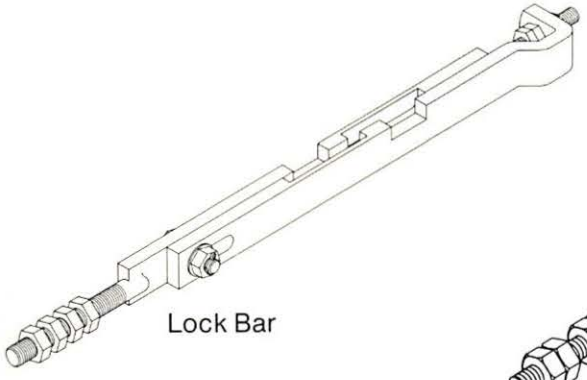
To Order: Specify Description and Part Number.

Item Number	Description	Part Number
1	Basket, Switch	110294-26
2	Basket, Switch	110294-27
3	Nut, Hex, 3/4"-10	2207-SC
4	Washer, Spring Lock, M, 3/4"	1815-MSC
5	Machine Bolt, Square Head, 3/4"-10 x 2.5"	110207-R184SA
6	Rod, Head for OB-2 Rod	110271-3
7	Rod, Head for Mead Rod M.P. Frog	110271-1
8	Rod, Head for DBL Slip SW.	110271-2
9	Rod, Back for DBL Slip SW.	110271-4
10	Bolt, 7/8"-9 x 4"	110207-265
11	Washer, Spring Lock, M, 7/8"	1816-MS
12	Nut, Hex, 7/8"-9	2116-S
13	Pin, Cotter, 3/16" x 1.5"	1035-S
14	Nut, Jam, 1-3/4"-5	2264-S
15	Nut, Hex, 1-3/4"-5	2214-S
16	T-Clip, Left Hand	110270-3
17	Washer	110272-8
18	Washer, Fiber Assy.	110272-1X
19	Tube, Liner	110270
20	Tube, Insulation	110271
21	Sleeve	110272-7X
22	T-Clip, Right Hand	110270-4
23	Washer, Cup	110272-4
24	Washer, Fiber Assy.	110272-2X
25	Washer	110272-11
26	Washer, Fiber	110272-3X
27	Washer Assy.	110272-9X
28	Washer Assy.	110272-10X

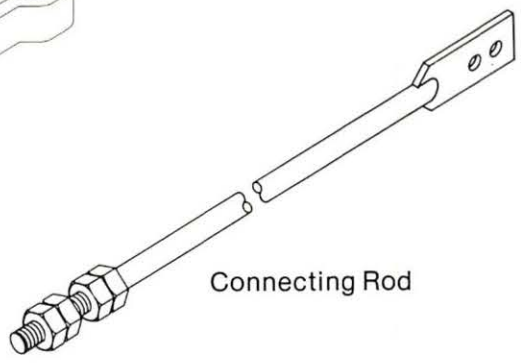
Safetran

LOCK BARS

LOCK BARS, LOCK PLATES, CONNECTING RODS



Lock Bar



Connecting Rod

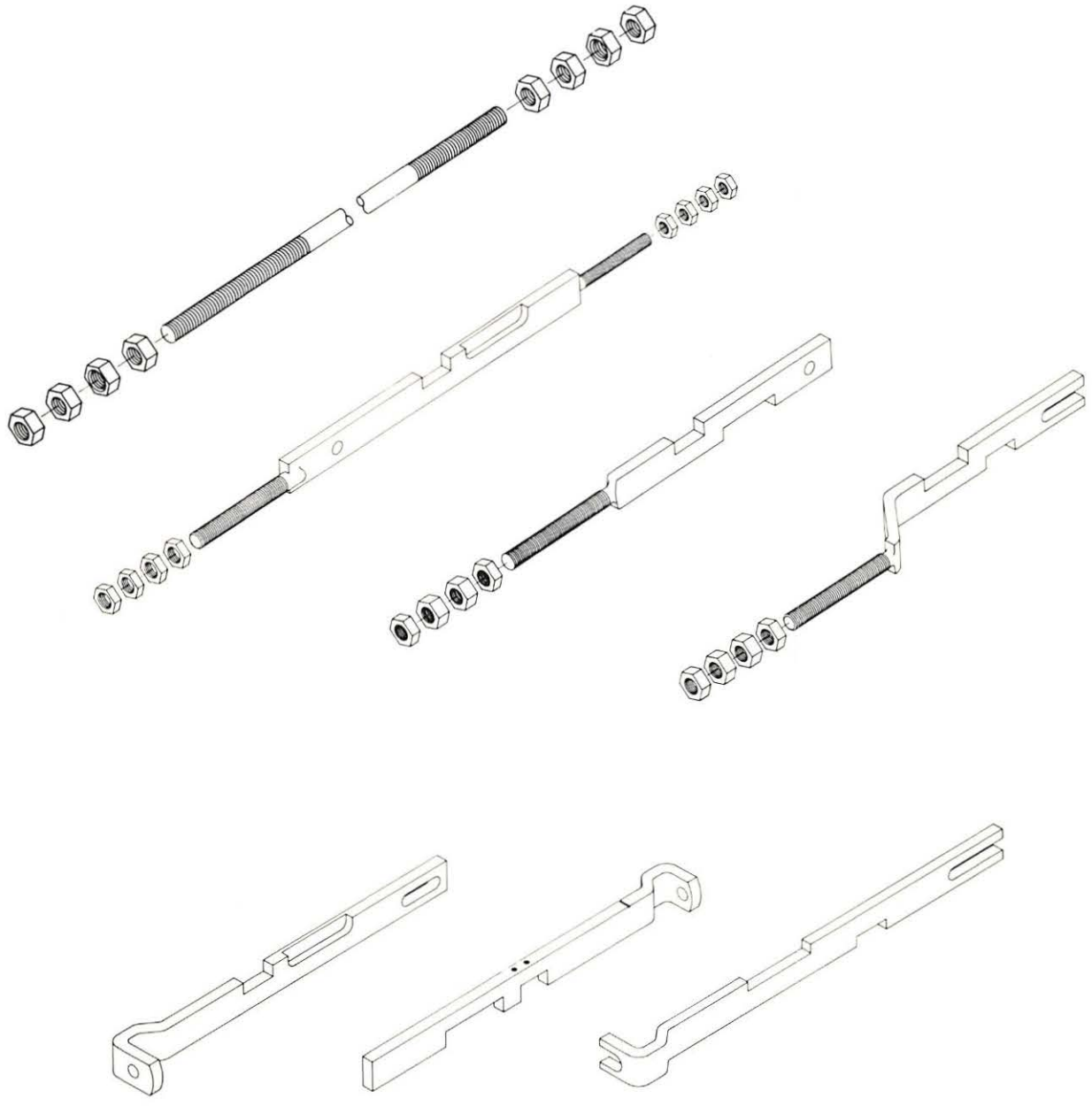
Safetran Lock Bars are forged from hot rolled steel and are normalized before machining and bending for added strength. These bars can be furnished in several styles, in any length, and with any offset to meet your specific switching requirements for switch machines or mechanical locking. Cup nuts and jam nuts on these bars assure a secure fit to either lugs or brackets.

Adjustable Lock Plates, for use with these bars, are also forged from hot rolled steel and normalized for added strength. Lock notches may be of any desired configuration and location on both the lock bars, and lock plates. These lock notches are extremely accurate to dimension, free from burrs, and have straight edges for efficient operation.

Lock Bar Lugs are of cast iron with optional alemite fitting for lubrication. They are carefully machined for a tight, secure fit to the bar.

Safetran Connecting Rods are forged from hot rolled steel and are normalized before machining and bending for added strength. These rods can be furnished in several styles, in any length, and with any offset to meet your specific switching requirements for switch machines or mechanical locking.

LOCK BARS AND PLATES ORDERING INFORMATION

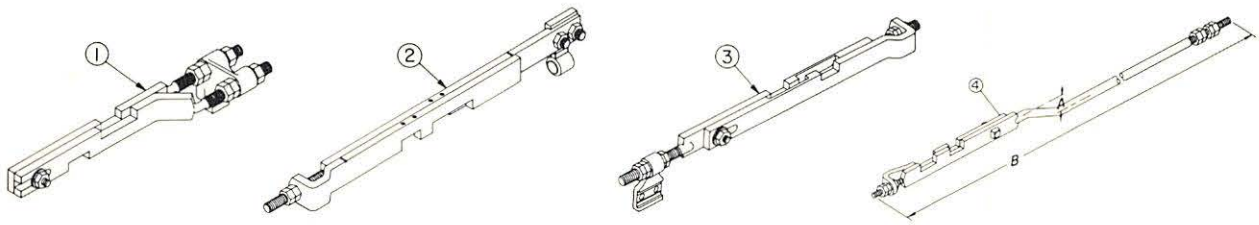


Safetran Lock Bars can be furnished in several styles, in any length, and with any offset to meet your specific requirements. Threads of bars may be of any size, and may constitute any desired length of the bar. Also, hardware configurations will be furnished per your specifications.

For desired lock plate, specify total length of plate and location with dimensions of lock notches and mounting holes.

It is impossible to list every lock bar or assembly; therefore, a drawing and/or complete specifications should be submitted with your order or inquiry.

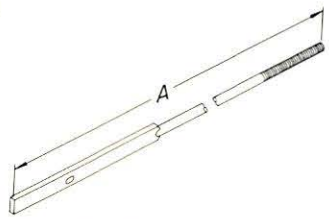
LOCK BAR ASSEMBLIES ORDERING INFORMATION



To Order: Specify Description, Dimensions and Part Number.

Item Number	Description	Dimensions	Part Number
1	Lock Bar Assembly for WABCO M23B Switch Machines Less Lug		110200-70X
2	Lock Bar Assembly for GRS Models 5A, 5C, and 5G Switch Machine		110200-152X
3	Lock Bar Assembly for GRS Model 9 Switch Machines		110200-24X
4	Lock Bar Assembly for GRS Model 4A	Specify A, B	110200

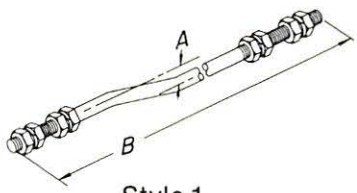
LOCK ROD FOR ELECTRIC SWITCH LOCK



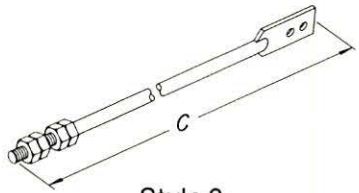
To Order: Specify Dimension and Part Number.

Description	Dimensions	Part Number
Electric Switch Lock Connecting Rod	Specify A	110200

ORDERING INFORMATION LOCK BAR CONNECTING RODS



Style 1



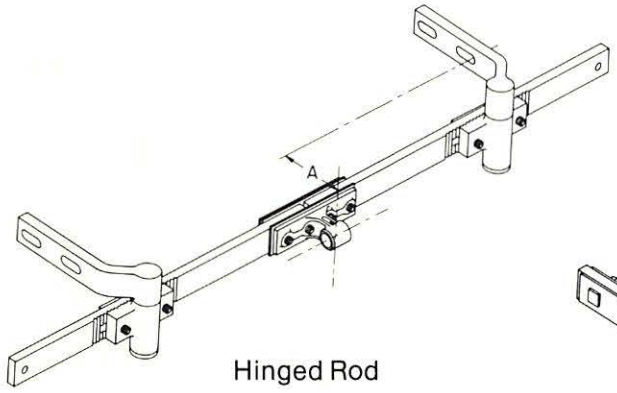
Style 2

To Order: Specify Description, Dimension and Part Number.

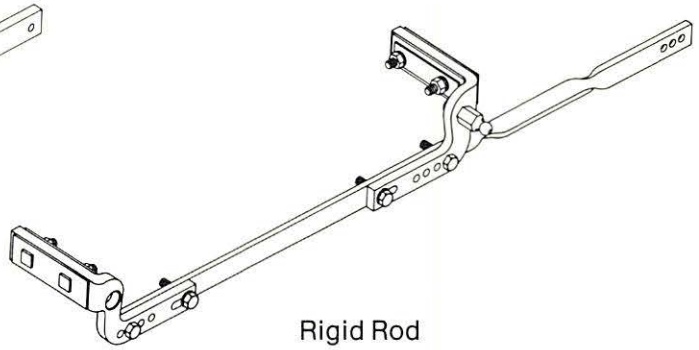
Description	Dimension	Part Number
Connecting Rod Style 1	Specify A, B	110200
Connecting Rod Style 2	Specify C	110200

ADJUSTABLE FRONT RODS

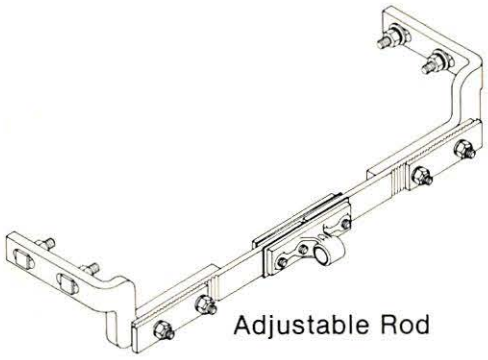
HINGED, RIGID ADJUSTABLE, ADJUSTABLE, SWIVEL



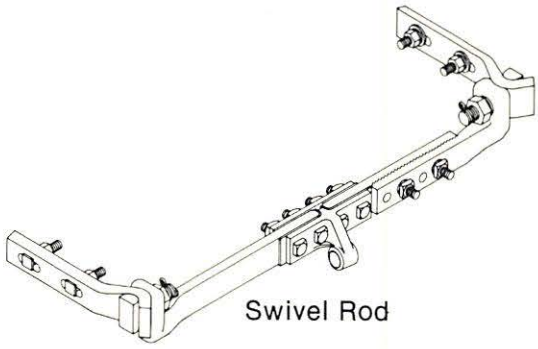
Hinged Rod



Rigid Rod



Adjustable Rod



Swivel Rod

Safetran Front Rods are adjustable to any point spacing encountered in standard switch gages. Their fine increments of adjustment allow these rods to adapt to various thicknesses of reinforcing bars and various switch openings. Front rods for other track gages are available as well.

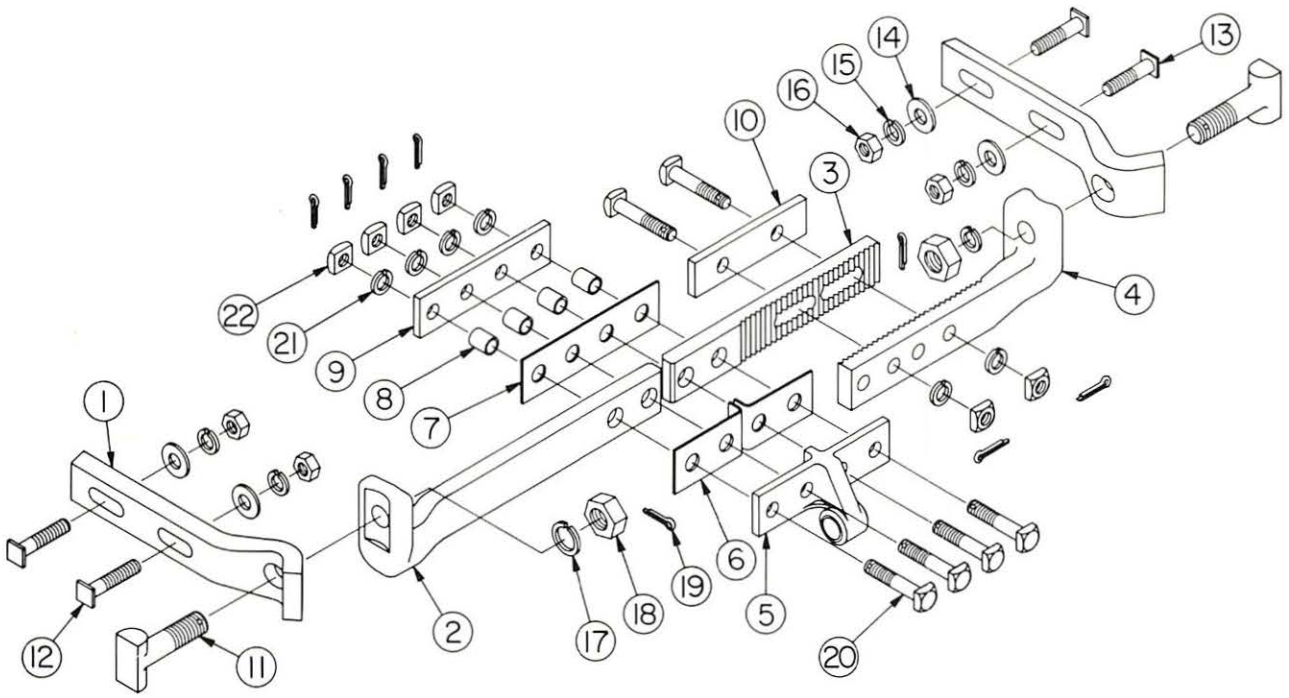
These front rods provide connection between switch points and lock or connecting rods. A positive and precise spacing is provided between switch points, as well as torsional stiffening for the switch points. These rods are symmetrical in construction; therefore, they may be used for either left-hand or right-hand switch configurations. All assemblies are constructed of high strength steel with fiber insulation.

Point lugs furnished with these rods are for 7/8 inch point drilling; however, lugs can be furnished for any other size drilling as well.

The lock rod switch brackets will accomodate 1-1/4 inch lock rods.

Detector lugs are also available for use with these rods, and may be found in section L-4 of this catalog.

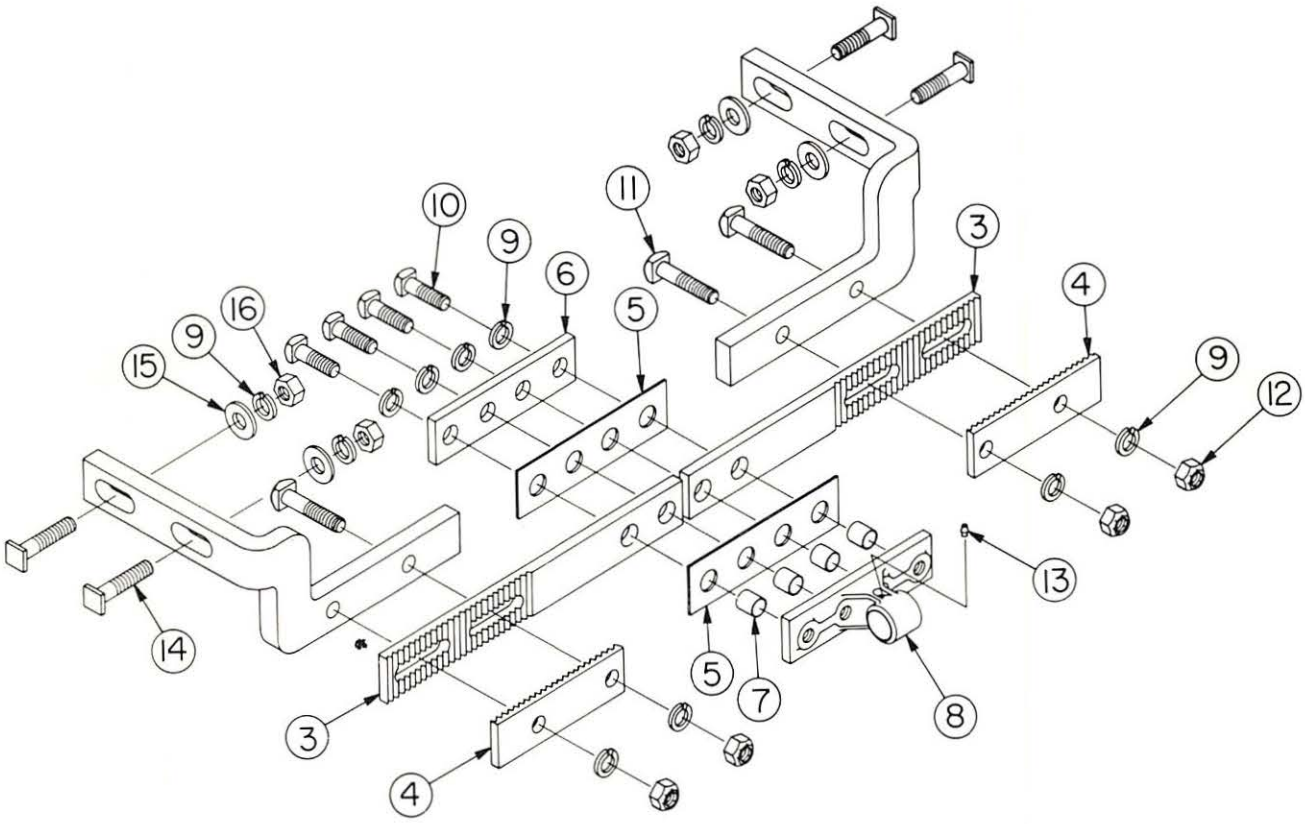
SWIVEL FRONT ROD REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Lug, Swivel Point	2	110291-7
2	Rod Swivel Point	1	110211-39
	Rod Swivel Point	1	110211-70
3	Plate, Serrated	1	110286-4
4	Rod Swivel Point	1	110211-35
	Rod Swivel Point	1	110211-71
5	Bracket, Switch Adjusting	1	110447-5
6	Plate, Insulation	2	110282-17
7	Plate, Insulation	1	110282
8	Bushing, Insulation	4	110283-3
9	Plate, Splice	1	110281
10	Plate, Splice	1	110281-36
11	Bolt, Swivel Point	2	110211-36
12	Mchine Bolt, Square Head, 3/4"-10 x 3.75"	2	110207-R194SC
13	Machine Bolt, Square Head, 3/4"-10 x 3"	2	110207-R188SC
14	Washer, Wrought, 3/4"	4	1758
15	Washer, Spring Lock, M, 3/4"	4	1815-MS
16	Nut, Hex, 3/4"-10	4	2114-S
17	Washer, Spring Lock, M, 1-1/4"	2	1819-MS
18	Nut, Hex, 1-1/4"-7	2	2211-SC
19	Pin, Cotter, 1/4" x 1.75"	8	1045-S
20	Bolt	6	110207-236
21	Washer, Spring Lock, H, 3/4"	6	1815-HS
22	Nut, Square, 3/4"-10	6	2496-S

ADJUSTABLE FRONT ROD REPLACEMENT PARTS

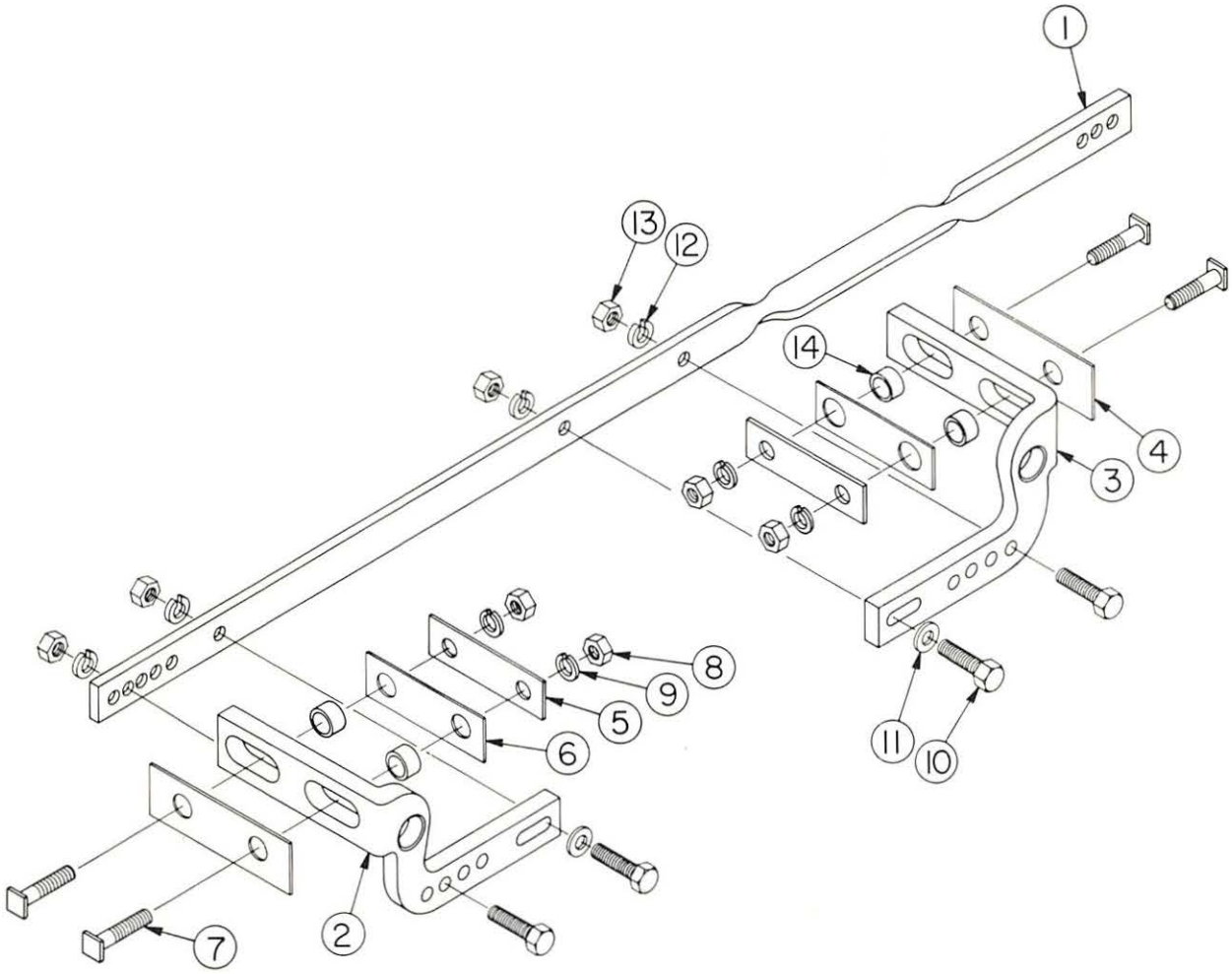


For Complete Assembly, Order Part Number 110287-1X.

To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Foot, Front Rod, Right-Hand	1	110211-5
2	Foot, Front Rod, Left-Hand	1	110210-5
3	Plate, Serrated	2	110286-1
4	Plate, Washer	2	110292-2
5	Plate, Insulation	2	110282
6	Plate, Splice	1	110281
7	Bushing, Insulation	4	110283
8	Bracket, Switch	1	110213-4
9	Washer, Spring Lock, M, 3/4″	12	1815-MS
10	Machine Bolt, Square Head, 3/4″-10 x 2.25″	4	8072-S
11	Machine Bolt, Square Head, 3/4″-10 x 3.25″	4	110207-R190HA
12	Nut, Esna, 3/4″-10	4	2207-3S
13	Fitting, Alemite	1	110445-S
14	Machine Bolt, Square Head, 3/4″-10 x 5″	4	110207-R200SC
15	Washer, Wrought, 3/4″	4	1758
16	Nut, Hex, 3/4″-10	4	2114-S

RIGID ADJUSTABLE FRONT ROD REPLACEMENT PARTS

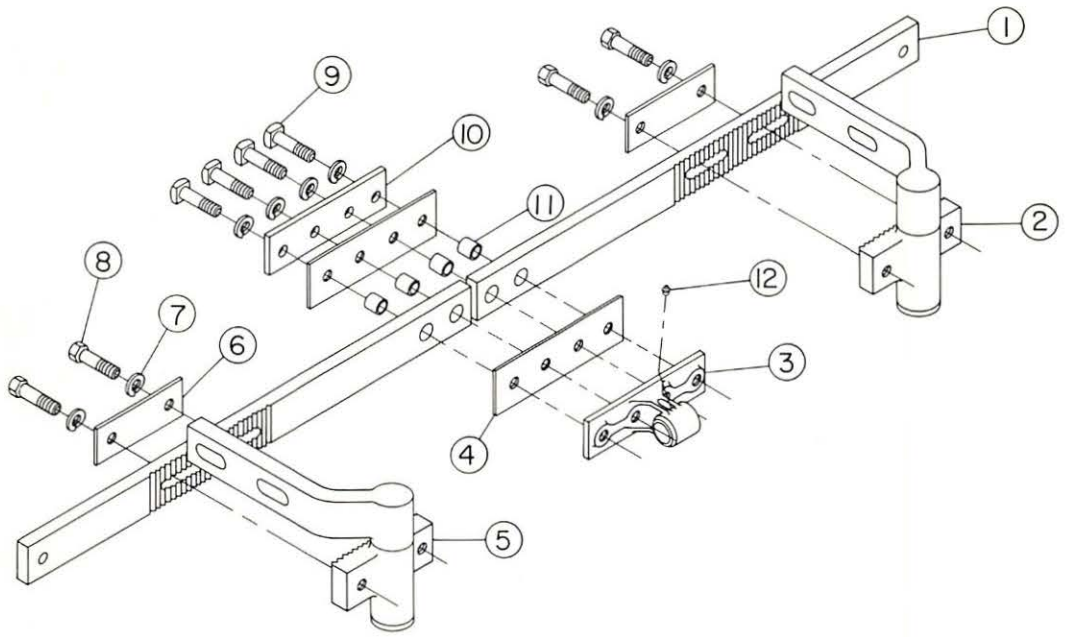


For Complete Assembly, Order Part Number 110287-3X.

To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Rod, Front	1	110287
2	Foot, Front Rod, Left-Hand	1	110210-2
3	Foot, Front Rod, Right-Hand	1	110211-2
4	Plate, Insulation	2	110282-10
5	Plate, Splice	2	110281-5
6	Plate, Insulation	2	110282-11
7	Machine Bolt, Square Head, 3/4″-10 x 5″	4	110207-R200SC
8	Nut, Hex, 1″-8	4	2118-SC
9	Washer, Spring Lock, H, 1″	4	1817-HSC
10	Machine Bolt, Hex Head, 3/4″-10 x 2.5″	4	110207-R186HA
11	Washer, Wrought, 3/4″	2	1758
12	Washer, Spring Lock, H, 3/4″	4	1815-HS
13	Nut, Hex, 3/4″-10	4	2207-SC
14	Bushing, Insulation	4	110283-6

HINGED FRONT ROD REPLACEMENT PARTS



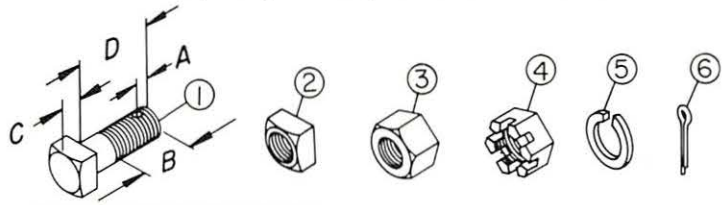
To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Plate, Serrated	2	110286-7
2	Pivot Assy RH*	1	110211
3	Bracket, Switch Adjust	1	110213-4
4	Plate, Insulation	2	110282
5	Pivot Assy LH*	1	110210
6	Plate, Splice	2	110281-94
7	Washer, Locking, M, 3/4"	8	1815-MSC
8	Hex Head MB 65, 3/4" x 2.5	4	110207-R184HA
9	Square Head MB 3/4"-10 x 3.0"	4	8075-S
10	Plate, Splice	1	110281
11	Bushing, Insulation	4	110283-3
12	Fitting, Grease	1	110445-5

*Note: Must Specify Part Number and Dimension (A) from pg. L-3-1.

TRACK BOLTS
ORDERING INFORMATION

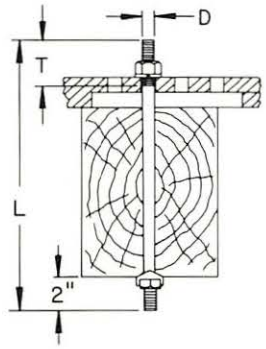
To Order: Specify Description and Part Number.

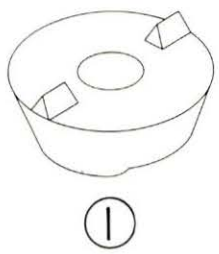


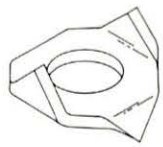
Item No	Description	Part Number
1	Track Bolt 3/4"	See note
	Track Bolt 1"	See note
2	Nut Square 3/4	2409-SC
	Nut Square 1"	2118-2
3	Nut Hex 3/4"	2114-SC
	Nut Hex 1"	2118-SC
4	Nut Hex Slotted 3/4"	2410-SC
	Nut Hex Slotted, 1"	2375-SC
5	Washer Locking 3/4"	1815-MSC
	Washer Locking 1"	1817-MSC
6	Cotter Pin for 3/4" Bolt	1034-SC
	Cotter Pin for 1" Bolt	1035-SC

Note: Specify Description, Dimensions A, (if cotter pin is required) B, C (1/4", 3/8" or 1/2") and D

STUD BOLTS
ORDERING INFORMATION







To Order: Specify Description and Part Number.

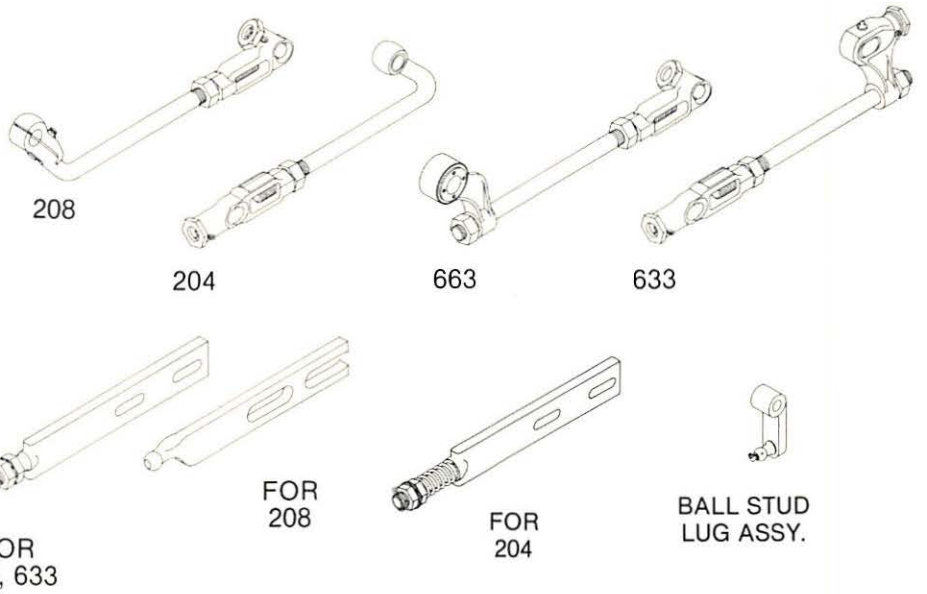
Description	Part Number
Stud Bolt Assembly	See note
Style 1 Bolt Grip 3/4"	110407-1
Style 1 Bolt Grip 1"	110407
Style 2 Bolt Grip	See note

Note: Specify Description, Dimensions L, T, D and Style of Bolt Grip Required.
(Diameter must be specified when ordering Style 2 Bolt Grip)

Safetran

CONTROLLER RODS

CONTROLLER RODS, SOCKETS, POINT LUGS, BALL STUD LUGS



Safetran Controller Rods are available for switch circuit controller to straight shank, tapered shank, or ball type point lug connections.

The Model 633 and 663 controller rods feature a straight rod with a tapered fit at the point socket end. The Model 633 and 663 are identical in application, but differ at the point lug socket. The Model 633 point socket utilizes bronze bearings, which are spring loaded at the point lug, and have grease fitting for lubrication. The 663 point socket utilizes two urethane bushings. These bushings very effectively snub the rough shocks and dampen the higher frequency vibrations. Both the Model 633 and 663 controller rods are for use with 1 inch diameter straight shank point lugs.

The Model 204 controller rod consists of a one piece point socket, forged from the rod itself. A bronze bushing is pressed into this point socket; allowing for the use of 1 inch diameter tapered point lugs.

The Model 208 controller rod, for use with ball point lugs, consists of forged point socket, clamp, and hardware to afford a snug fit to the 1-3/8 inch diameter ball end.

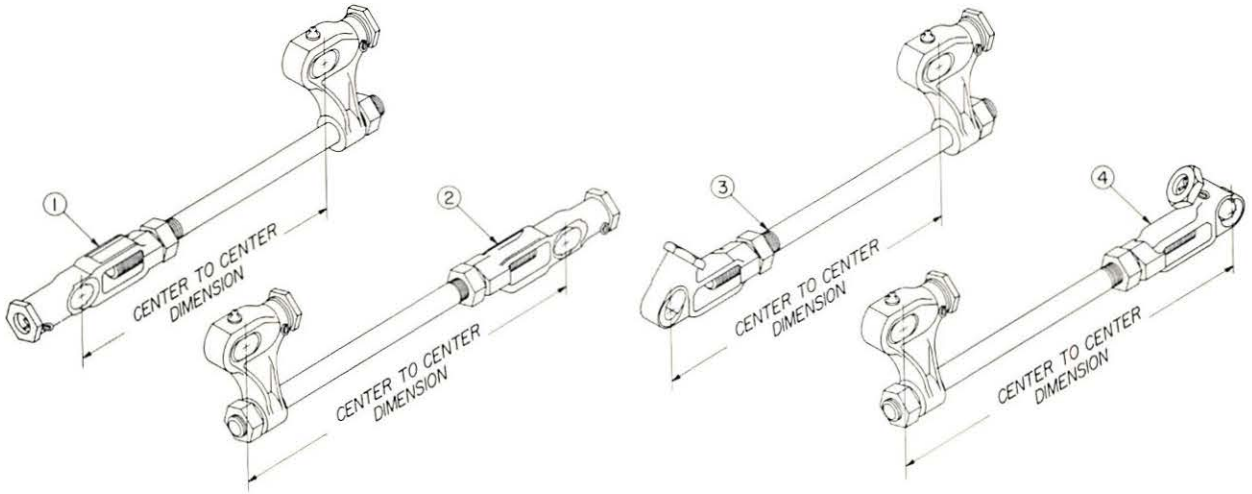
All rods are furnished with either the straight or offset controller socket. These sockets for the controller end include heavy coil springs and bronze plunger to maintain the relation of the controller socket to the ball stud, while adjusting for wear as it occurs. Use of these sockets will reduce wear on the bushings within the switch circuit controller.

Ball Studs, available insulated or non-insulated, have ball ends of 1 inch in diameter, with or without grease fitting for lubrication. These ball ends are case hardened, providing a strong, smooth finish and a snug fit within the socket.

With this variety of controller rods, sockets, and point lugs available, an efficient connection of front rod to controller is possible for any switching application.

MODEL 633 CONTROLLER RODS

FOR CONTROLLER TO STRAIGHT SHANK POINT LUG CONNECTION



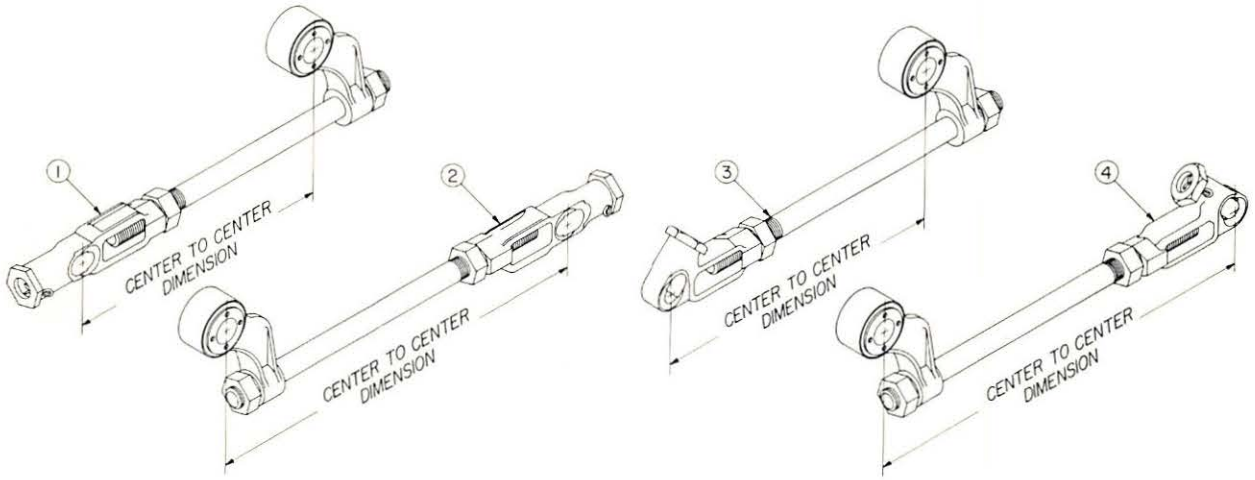
To Order: Specify Model 633 Controller Rod and Part Number.

Item Number	Center to Center Dimension In Inches	Application	Part Number
1	96-1/4	For Near Rail, with Straight Controller Socket	110633-1432X
	46	For Near Rail, with Straight Controller Socket	110633-1411X
	42-1/4	For Near Rail, with Straight Controller Socket	110633-1401X
	35	For Near Rail, with Straight Controller Socket	110633-1409X
	30	For Near Rail, with Straight Controller Socket	110633-1407X
2	92-1/4	For Far Rail, with Straight Controller Socket	110633-2400X
3	84	For Near Rail, with Offset Controller Socket	110633-3413X
	62	For Near Rail, with Offset Controller Socket	110633-3439X
	61	For Near Rail, with Offset Controller Socket	110633-3438X
	57	For Near Rail, with Offset Controller Socket	110633-3402X
	46-3/8	For Near Rail, with Offset Controller Socket	110633-3401X
	42-1/4	For Near Rail, with Offset Controller Socket	110633-3410X
	36	For Near Rail, with Offset Controller Socket	110633-3429X
	33-7/8	For Near Rail, with Offset Controller Socket	110633-3400X
	32-1/4	For Near Rail, with Offset Controller Socket	110633-3411X
4	92-1/4	For Far Rail, with Offset Controller Socket	110633-4401X

For controller rods other than those shown, specify Model 633 controller rod, application, and center to center dimension in inches.

MODEL 663 CONTROLLER RODS

FOR CONTROLLER TO STRAIGHT SHANK POINT LUG CONNECTION



To Order: Specify Model 633 Controller Rod and Part Number.

Item Number	Center to Center Dimension In Inches	Application	Part Number
1	94-1/4	For Near Rail, with Straight Controller Socket	110633-1423X
	42-1/4	For Near Rail, with Straight Controller Socket	110633-1400X
2	92-1/4	For Far Rail, with Straight Controller Socket	110633-2400X
	87-1/2	For Far Rail, with Straight Controller Socket	110633-2404X
3	96	For Near Rail, with Offset Controller Socket	110633-3404X
	62	For Near Rail, with Offset Controller Socket	110633-3419X
	61	For Near Rail, with Offset Controller Socket	110633-3420X
	42-1/4	For Near Rail, with Offset Controller Socket	110633-3402X
	38-1/2	For Near Rail, with Offset Controller Socket	110633-3406X
	25-3/4	For Near Rail, with Offset Controller Socket	110633-3409X
4	143	For Far Rail, with Offset Controller Socket	110633-4400X
	111	For Far Rail, with Offset Controller Socket	110633-4403X
	110	For Far Rail, with Offset Controller Socket	110633-4404X
	92-1/4	For Far Rail, with Offset Controller Socket	110633-4401X

For controller rods other than those shown, specify Model 633 controller rod, application, and center to center dimension in inches.

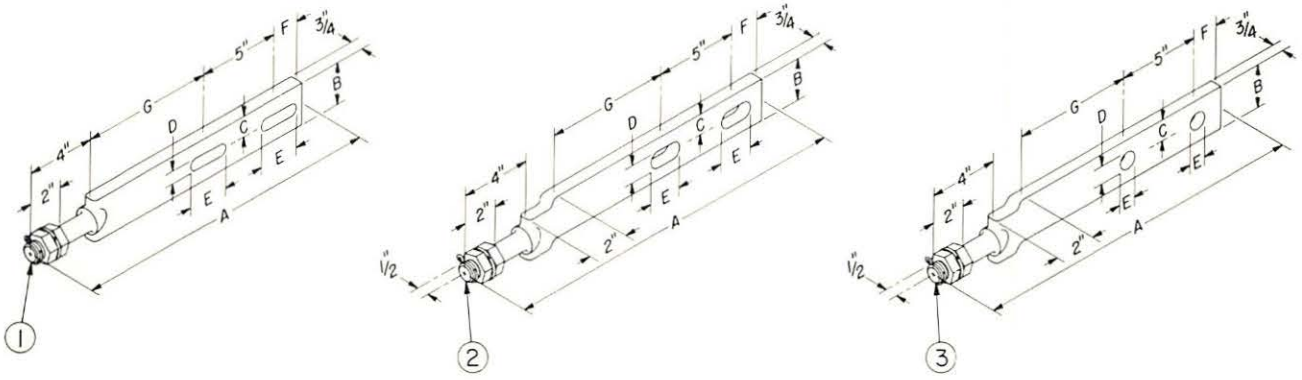
MODEL 633 AND 663 CONTROLLER ROD REPLACEMENT PARTS

To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Point Socket Assembly (Near Rail)	1	110633-4X
	Point Socket Assembly (Far Rail)	1	110633-5X
	Includes: A. Socket, Point (Near Rail)	1	110633-1
	Socket, Point (Far Rail)	1	110633-2
	B. Bearing, Socket	2	110633-181
	C. Fitting, Alemite	1	110333-8A
	D. Pin, Cotter, 1/8″ x 1″	1	1017-SC
	E. Plunger, Socket	1	110633-179
	F. Spring, Socket	1	110633-175
	G. Plug, Socket	1	110633-177
2	Point Socket Assembly (Near Rail)	1	110663-4X
	Point Socket Assembly (Far Rail)	1	110663-5X
	Includes: A. Socket, Point (Near Rail)	1	110663-208
	Socket, Point (Far Rail)	1	110663-207
	B. Bearing	2	110663-33A
3	Straight Controller Socket Assembly	1	110633-192X
	Includes: A. Socket, Controller, Straight	1	110633-192
	B. Pin, Cotter, 1/8″ x 1″	1	1017-SC
	C. Plunger, Socket	1	110633-188
	D. Spring, Socket	1	110633-175
	E. Plug, Socket	1	110633-177
4	Offset Controller Socket Assembly	1	110633-190X
	Includes: A. Socket, Controller, Offset	1	110633-190
	B. Plunger, Socket	1	110633-188
	C. Spring, Socket	1	110633-175
	D. Plug, Socket	1	110633-177
	E. Pin, Cotter, 1/8″ x 1″	1	1017-SC
5	Rod, Controller (specify length in inches)	1	Specify
6	Nut, Hex, 1″-8	2	2209-SC
7	Washer, Spring Lock, M, 1″	2	1817-MSC

STRAIGHT SHANK POINT LUGS

FOR USE WITH MODEL 633 AND 663 CONTROLLER RODS

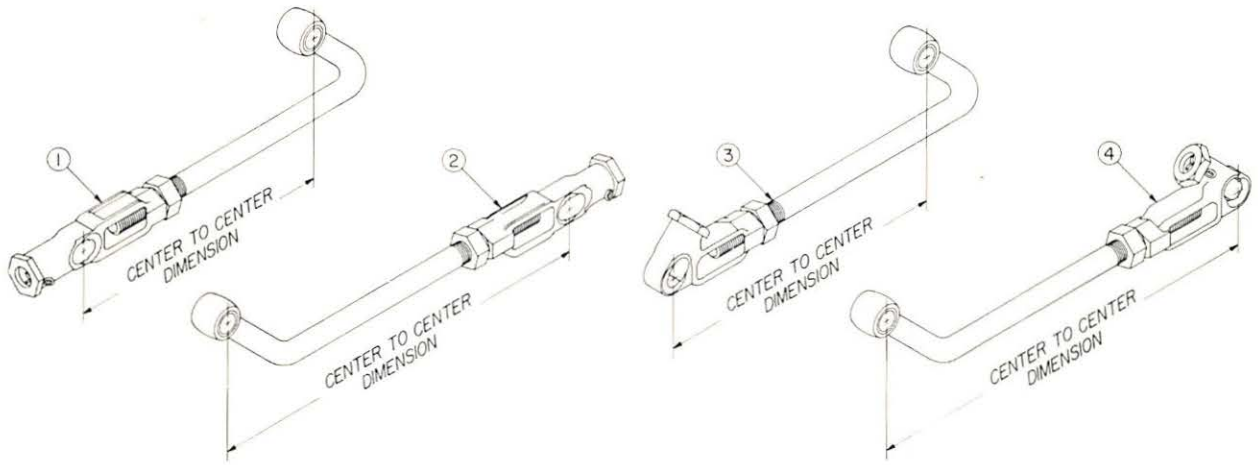


To Order: Specify Straight Shank Point Lug and Part Number.

Item Number	Dimensions In Inches							Part Number
	A	B	C	D	E	F	G	
1	20-1/4	2-1/2	1-1/4	25/32	2-1/2	1-5/8	9-5/8	110333-105X
	20-1/4	2-1/2	1-1/4	1-1/32	2-1/2	1-5/8	9-5/8	110333-106X
	18-3/4	2-1/2	1-1/4	25/32	2-1/2	1-5/8	8-1/8	110333-107X
	18-3/4	2-1/2	1-1/4	1-1/32	2-1/2	1-5/8	8-1/8	110333-108X
	16-5/8	2-1/2	1-1/4	25/32	2-1/2	1-5/8	6	110333-109X
	16-5/8	2-1/2	1-1/4	1-1/32	2-1/2	1-5/8	6	110333-110X
	14-3/4	2-1/2	1-1/4	25/32	2-1/2	1-5/8	4-1/8	110333-111X
	14-3/4	2-1/2	1-1/4	1-1/32	2-1/2	1-5/8	4-1/8	110333-112X
2	21	2-1/2	1-1/4	1-1/32	2-1/2	1-3/4	8-1/4	110333-102X
	20-3/8	2-1/2	1-1/4	25/32	2-1/2	1-1/2	7-7/8	110333-80SX
	20-3/8	2-1/2	1-1/4	1-1/32	2-1/2	1-1/2	7-7/8	110333-65SX
	18-3/8	2-1/2	1-1/4	25/32	2-1/2	1-5/8	5-3/4	110333-78SX
	18	2-1/2	1-1/4	1-1/32	2-1/2	1-3/4	5-1/4	110333-101X
	17-3/8	2	1	25/32	2-1/2	1-5/8	4-3/4	110333-51X
	17-1/8	2	1	1-1/32	3	3-5/8	2-1/2	110333-150X
	17-1/8	2	1	25/32	2	3-1/8	3	110333-149X
	15-7/8	2-1/2	1-1/4	1-1/32	2-1/2	1-5/8	3-1/4	110333-182X
	15-7/8	2	1	25/32	2-1/2	1-5/8	3-1/4	110333-181X
	15-1/2	2	1	1-1/32	2	1-3/8	2-1/8	110333-151X
3	24	2	1	Not Drilled		—	—	110333-120X
	20-3/8	2-1/2	1-1/4	1-1/32 Diameter		1-1/4	8-1/8	110333-65X
	20-3/8	2-1/2	1-1/4	Not Drilled		—	—	110333-187X
	19-1/2	2-1/2	1-1/4	1-1/32 Diameter		1-3/8	7-1/4	110333-71X
	18-3/8	2-1/2	1-1/4	1-1/32 Diameter		1-3/8	6	110333-61X
	18-3/8	2-1/2	1-1/4	25/32 Diameter		1-3/8	6	110333-78X
	17-1/8	2	1	25/32 Diameter		1-3/8	4-3/4	110333-54X
	17-1/8	2-1/2	1-1/4	1-1/32 Diameter		1-3/8	4-3/4	110333-56X
	17-1/8	2-1/2	1-1/4	Not Drilled		—	—	110333-146X
	14-3/8	2-1/2	1-1/4	1-1/32 Diameter		1-3/8	2	110333-55X

MODEL 204 CONTROLLER RODS

FOR CONTROLLER TO TAPERED SHANK POINT LUG CONNECTION

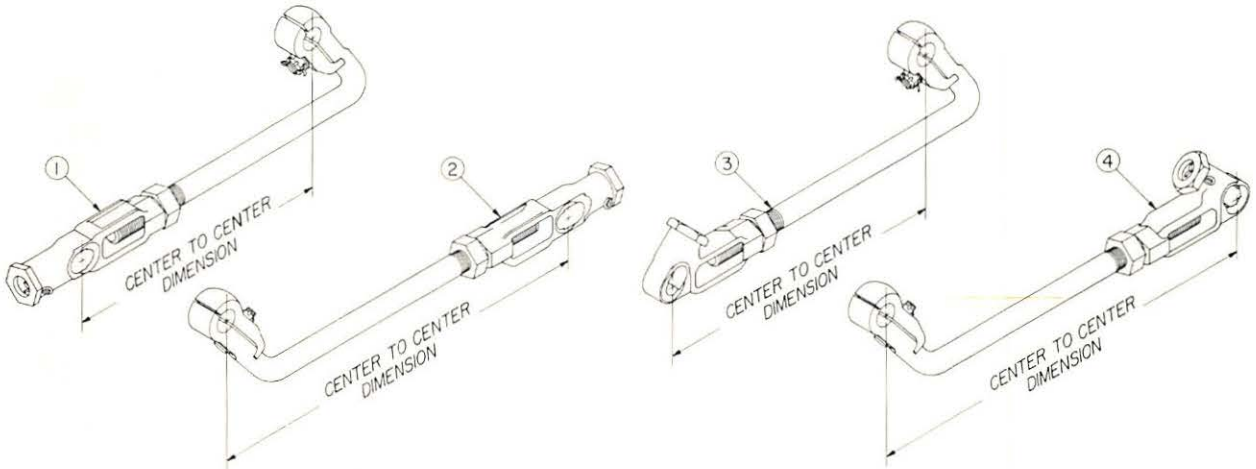


For Model 204 Controller Rods, Specify the following:

1. Model 204 Controller Rod
2. Application - Either Far or Near Rail
3. Center to Center Dimension in Inches
4. Controller Socket Desired - Either Straight or Offset

MODEL 208 CONTROLLER RODS

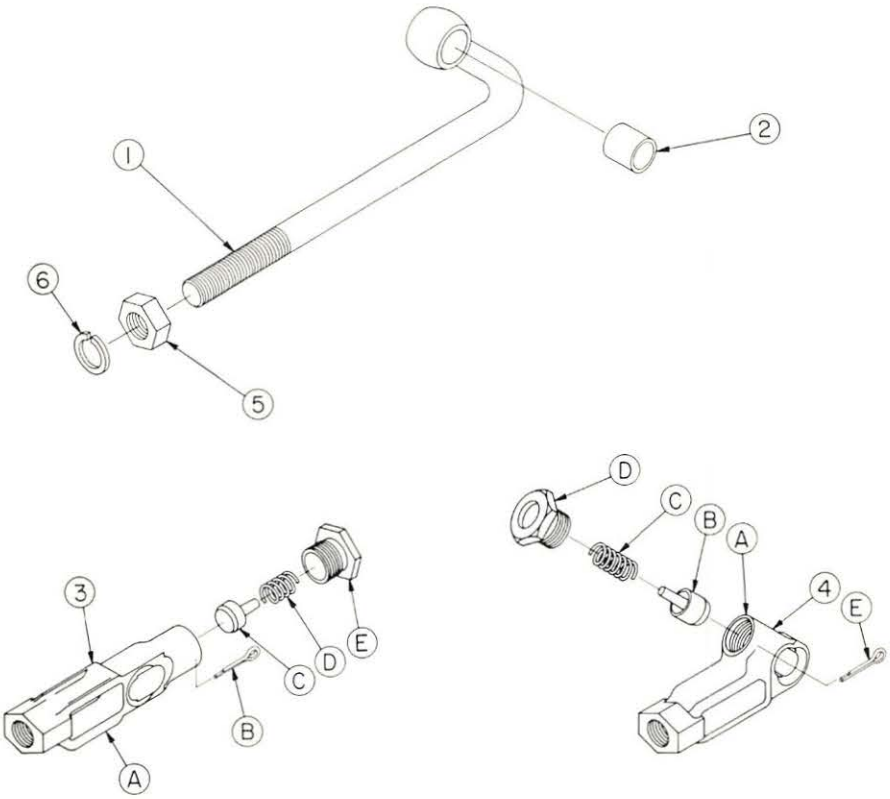
FOR CONTROLLER TO BALL POINT LUG CONNECTIONS



For Model 208 Controller Rods, Specify the following:

1. Model 208 Controller Rod
2. Application - Either Far or Near Rail
3. Center to Center Dimension in Inches
4. Controller Socket Desired - Either Straight or Offset

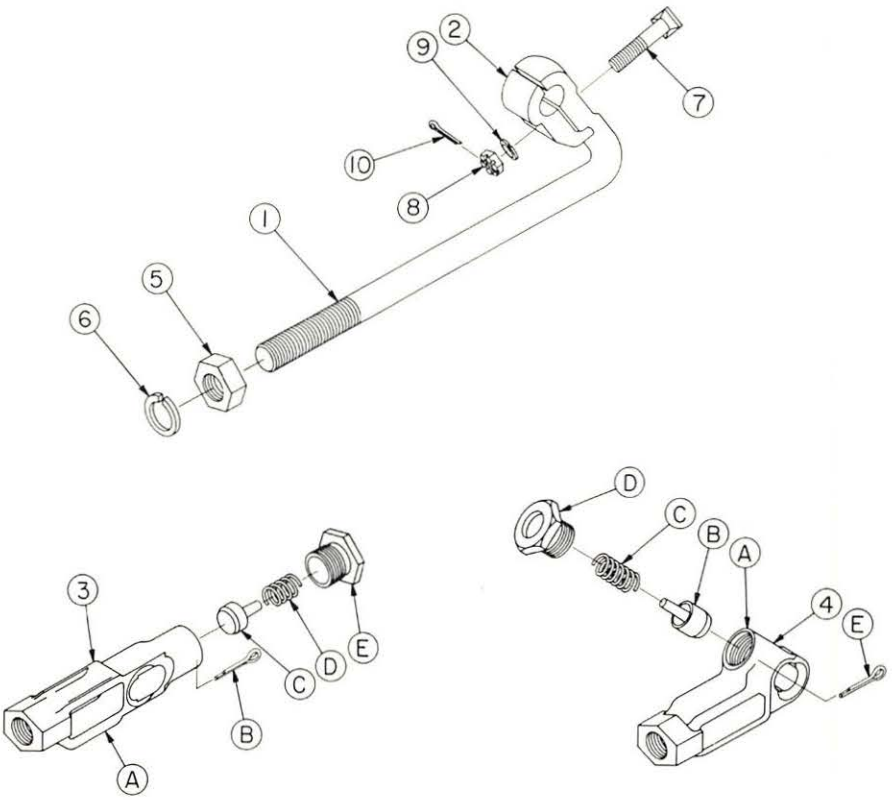
MODEL 204 CONTROLLER ROD REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Controller Rod, Model 204 (specify length in inches)	1	Specify
2	Bushing, Tapered	1	110205
3	Straight Controller Socket Assembly	1	110633-192X
	Includes: A. Socket, Controller, Straight	1	110633-192
	B. Pin, Cotter, 1/8″ x 1″	1	1017-SC
	C. Plunger, Socket	1	110633-188
	D. Spring, Socket	1	110633-175
	E. Plug, Socket	1	110633-177
4	Offset Controller Socket Assembly	1	110633-190X
	A. Socket, Controller, Offset	1	110633-190
	B. Plunger, Socket	1	110633-188
	C. Spring, Socket	1	110633-175
	D. Plug, Socket	1	110633-177
	E. Pin, Cotter, 1/8″ x 1″	1	1017-SC
5	Nut, Hex, 1″-8	1	2209-SC
6	Washer, Spring Lock, M, 1″	1	1817-MSC

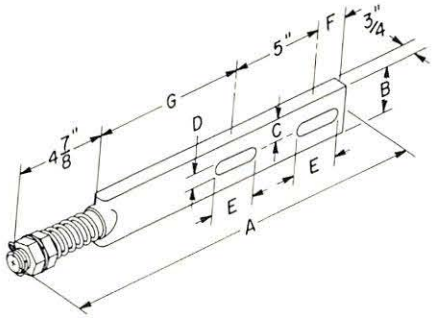
MODEL 208 CONTROLLER ROD REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Controller Rod, Model 208 (specify length in inches)	1	Specify
2	Clamp, Controller Rod	1	110208-8
3	Straight Controller Socket Assembly	1	110633-192X
	Includes: A. Socket, Controller, Straight	1	110633-192
	B. Pin, Cotter, 1/8″ x 1″	1	1017-SC
	C. Plunger, Socket	1	110633-188
	D. Spring, Socket	1	110633-175
	E. Plug, Socket	1	110633-177
4	Offset Controller Socket Assembly	1	110633-190X
	A. Socket, Controller, Offset	1	110633-190
	B. Plunger, Socket	1	110633-188
	C. Spring, Socket	1	110633-175
	D. Plug, Socket	1	110633-177
	E. Pin, Cotter, 1/8″ x 1″	1	1017-SC
5	Nut, Hex, 1″-8	1	2209-SC
6	Washer, Spring Lock, M, 1″	1	1817-MSC
7	Bolt	1	110207-4
8	Nut, Slotted, Hex Head	1	110209-7
9	Washer, Spring Lock, H, 5/8″	1	1814-HS
10	Pin, Cotter, 1/8″ x 1.5″	1	1019-SC

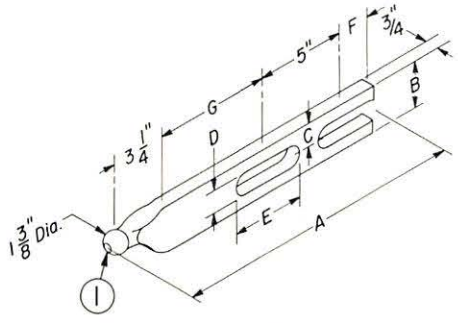
TAPERED SHANK POINT LUGS
(FOR USE WITH MODEL 204 CONTROLLER RODS)

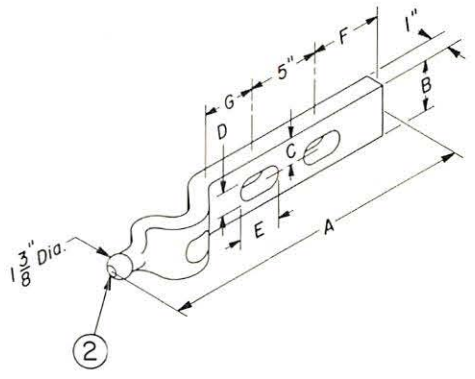


To Order: Specify Tapered Shank Point Lug and Part Number.

Item Number	Dimensions In Inches							Part Number
	A	B	C	D	E	F	G	
1	18	2	1	25/32	2	1-3/8	6-3/4	110333-233X
	15-1/4	2-1/2	1-1/4	1-1/32	2	1-3/8	4	110333-234X
	15-1/4	2	1	25/32	2	1-3/8	4	110333-235X
	18	2-1/2	1-1/4	1-1/32	2	1-3/8	6-3/4	110333-236X
	18-1/2	2-1/2	1-1/4	25/32	2-1/2	1-7/8	6-3/4	110333-237X

BALL POINT LUGS
(FOR USE WITH MODEL 208 CONTROLLER RODS)



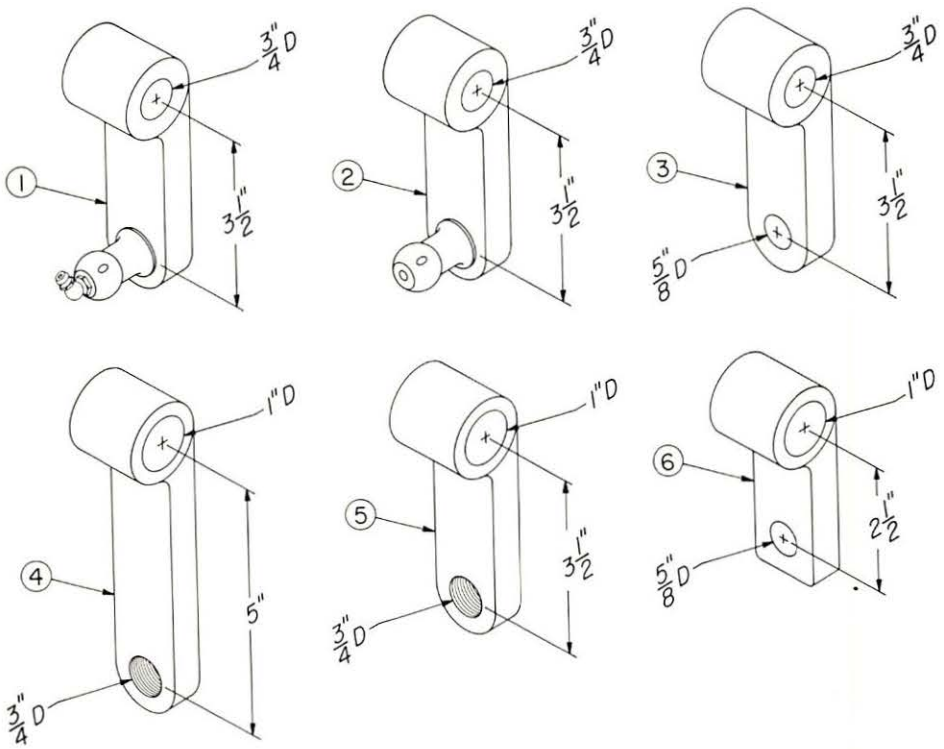


To Order: Specify Ball Point Lug and Part Number.

Item Number	Dimensions In Inches							Part Number
	A	B	C	D	E	F	G	
1	16-5/8	2-1/2	1-1/4	1-9/32	4-1/32	1-3/4	6-5/8	110333-164
*2	18	2-3/4	1-3/8	1-1/16	2	4-1/8	1-3/4	110291-29

*This ball point lug may also be used in place of a swivel point lug on Safetran swivel front rod. See page L-3-2 for application.

BALL STUD LUGS

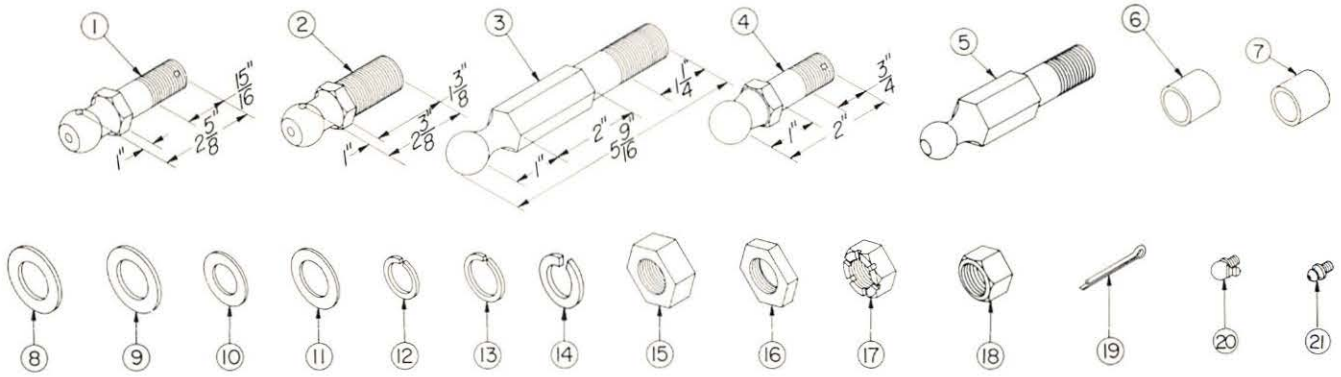


To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required
1	Ball Stud Lug Assy.	110333-113X
2	Ball Stud Lug Assy.	110333-116X
3	Lug, Ball Stud	110333-114
4	Lug, Ball Stud	110333-143X
5	Lug, Ball Stud	110333-158
6	Lug, Ball Stud	110333-188

Note: See page L-4-12 for ball studs to be used with these lugs.

BALL STUD ASSEMBLIES



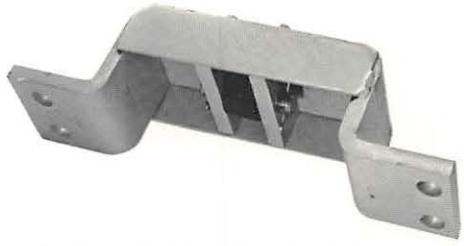
To Order: Specify Description and Part Number.

Item Number	Description	Part Number
A	Ball Stud Assy. (Includes Items 1, 6, 8, 10, 17, 19 and 21)	110556-6X
B	Ball Stud Assy. (Includes Items 1, 12, 17, 19, and 20)	110556-51X
C	Ball Stud Assy. (Includes Items 1, 12, 17, and 19)	110556-52X
D	Ball Stud Assy. (Includes Items 1, 6, 8, 10, 17, 19, and 20)	110556-53X
E	Ball Stud Assy. (Includes Items 1, 6, 8, 10, 17, and 19)	110556-54X
F	Ball Stud Assy. (Includes Items 2, 13, and 16)	110556-55X
G	Ball Stud Assy. (Includes Items 1, 12, 17, 19, and 21)	110556-56X
H	Ball Stud Assy. (Includes Items 1, 6, 17, and 19)	110556-58X
J	Ball Stud Assy. (Includes Items 3, 11, and 15)	110556-69X
K	Ball Stud Assy. (Includes Items 2, 13, 16, and 21)	110556-71X
L	Ball Stud Assy. (Includes Items 4, 7, 9, 10, 17, and 19)	110556-74X
M	Ball Stud Assy. (Includes Items 2, 13, 16, and 20)	110556-76X
N	Ball Stud Assy. (Includes Items 5, 14, and 18)	110556-66X
1	Stud, Ball, (1" Diameter Ball, 5/8"-11 Threaded Stud)	110556-6A
2	Stud, Ball, (1" Diameter Ball, 3/4"-10 Threaded Stud)	110556-55
3	Stud, Ball, (1" Diameter Ball, 3/4"-10 Threaded Stud)	110556-69
4	Stud, Ball, (1" Diameter Ball, 5/8"-11 Threaded Stud)	110556-74
5	Stud, Ball, (1-3/8" Diameter Ball, 1-1/8"-7 Threaded Stud)	110556-66
6	Bushing, Insulation (for 5/8" Stud) AAR 12714	110556-6B
7	Bushing, Insulation (for 5/8" Stud)	110205-2
8	Washer, Insulation (for 5/8" Stud) AAR 12716	110556-68
9	Washer, Insulation (for 5/8" Stud)	110205-4
10	Washer, Wrought, 5/8"	1757-C
11	Washer, Wrought, 3/4"	1758-C
12	Washer, Spring Lock, M, 5/8"	1814-MSC
13	Washer, Spring Lock, M, 3/4"	1815-MSC
14	Washer, Spring Lock, M, 1-1/8"	1818-MSC
15	Nut, Hex, 3/4"-10	2114-SC
16	Nut, Hex Jam, 3/4"-10	2257-SC
17	Nut, Slotted Hex, 5/8"-11	2378-SC
18	Nut, Nex, 1-1/8"-7	2210-SC
19	Pin, Cotter, 1/8" x 1.5"	1019-SC
20	Fitting, Alemite, 3/16", 45°	110445-1
21	Fitting, Alemite, 3/16"	110445-2

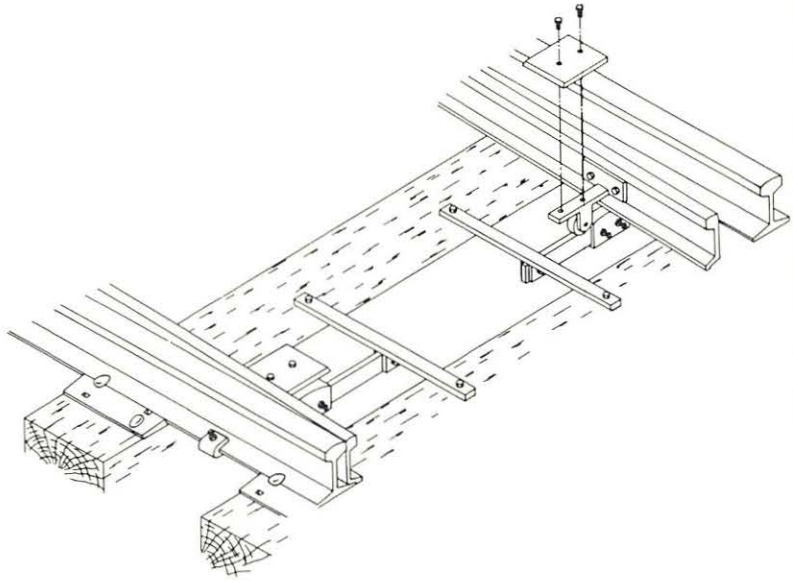
Safetran

SWITCH POINT ROLLER ASSEMBLIES

Cast Switch Point Roller



Fabricated Switch Point Roller



Toe Switch Point Roller

Safetran Switch Point Roller Assemblies are extremely rugged devices that reduce the effort required in switch point movement. Not only do they eliminate the sliding friction between switch points and gauge plates, but subsequent wear to those parts is reduced as well. In addition, less strain is placed on the switch machine, resulting in fewer repairs and longer life for that unit.

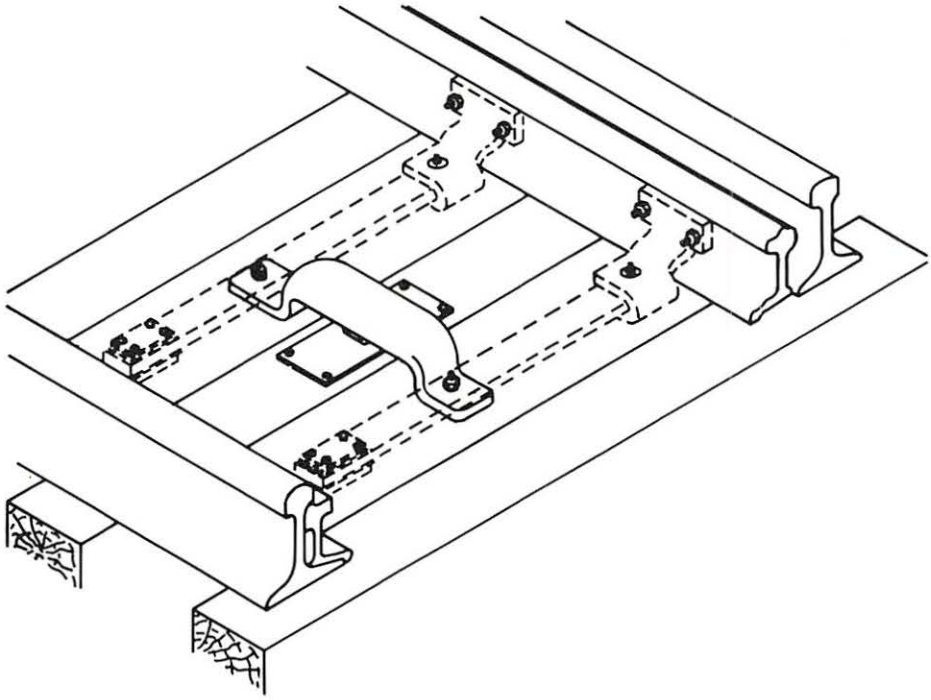
These switch point roller assmeblies are furnished complete with roller housing assembly and roller plate with lag screws for mounting to the tie.

The cast and fabricated switch point rollers are used on layouts using horizontal switch rods. The toe/heel switch point rollers are used for application with either vertical or horizontal switch rods.

Mounting bars, either insulated or non-insulated, and point attachments can be furnished with both the cast and fabricated switch point roller assemblies.

An application drawing and/or complete specifications of item desired should be furnished with your order or inquiry.

SWITCH POINT ROLLER ASSEMBLIES ORDERING INFORMATION



Typical Application of Fabricated or Cast Switch Point Roller Assembly
(Shown with Mounting Bars and point Attachments)

To Order: Specify Description and Part Number.

Description	Part Number
Cast Switch Point Roller Assembly For 100# Rail	141300-X
Cast Switch Point Roller Assembly For 132# Rail	141300-1X
Fabricated Switch Point Roller Assembly For 132# Rail	141300-3X

Switch Point Roller Assemblies for sizes of rail other than those listed will be furnished upon request. An application drawing and/or complete specifications should be furnished with your order or inquiry.

TOE/HEEL SWITCH ROLLER ASSEMBLIES

To Order: Specify Description and Part Number.

Description	Part Number
Toe, Switch Point Roller Assembly	110233-48X
Heel, Switch Point Roller Assembly	110233-63X

The Toe Switch Point Roller Assembly has a longer riser sleeve than the heel switch point roller. This compensates for greater travel at the toe of the point as compared to the heel.

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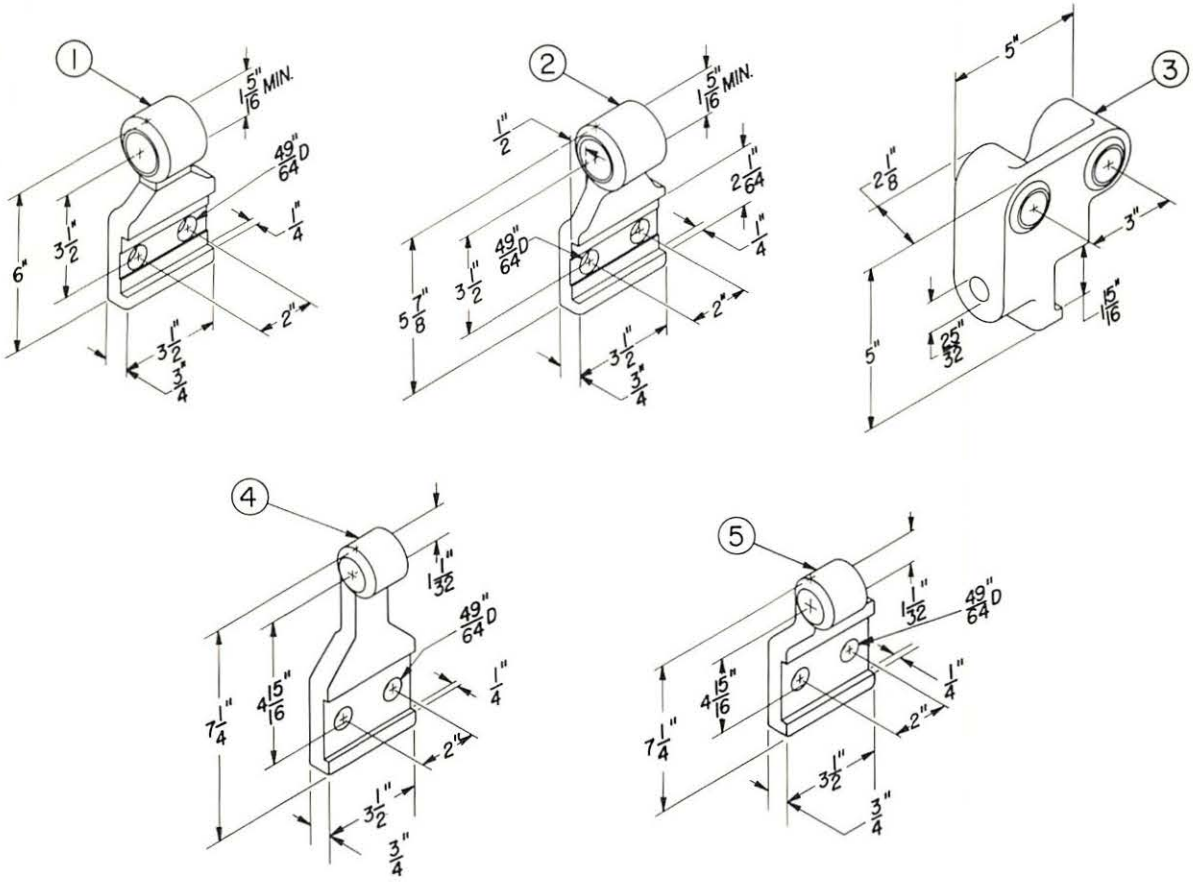
LUGS



Lock Bar Lugs are of cast iron with optional alemite fitting for lubrication. They are carefully machined for a tight, secure fit of lock rod to connecting rod.

ORDERING INFORMATION

To Order: Specify Description and Part Number.

Item Number	Description	Note	Part Number
1	Lug Straight	Used on Lock Rod Assy. 1, 2 pg. L-2-3	110206-10
2	Lug Offset 1/2"	Used on Lock Rod Assy. 1, 2 pg. L-2-3	110206-11
3	Lug	Used on Lock Rod Assy. 1 pg. L-2-3	110206-12
4	Lug	Used on Lock Rod Assy. 3 pg. L-2-3	110206-15
5	Lug	Used on Lock Rod Assy. 3 pg. L-2-3	110206-5

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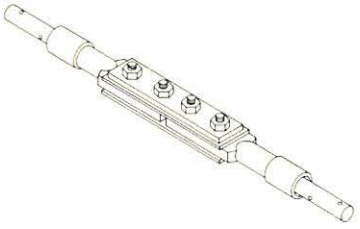
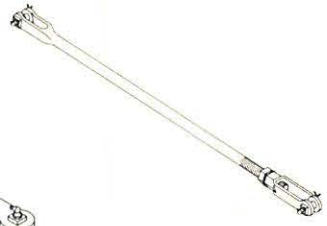
PIPELINE EQUIPMENT

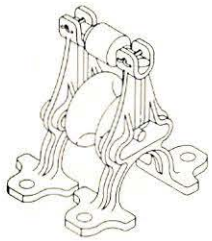


Insulated Coupling

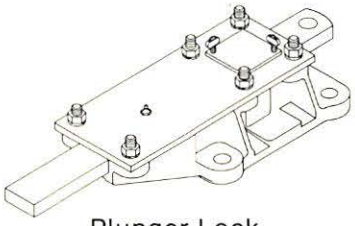
Tang End



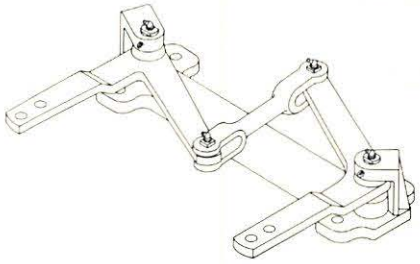
Adjustable Link



Carrier



Plunger Lock



Compensator

Safetran Pipeline Parts, constructed of steel, provide the smooth yet rigid transfer of movement required for pipeline. Equipment available includes: Tang End Rods, Couplings, Cranks, Crank Stands, Compensators, and Pipe Carriers; each of which meet or exceed AAR specifications.

The tang end rods are available in a variety of lengths, with or without offsets. All integral clevices are forged from the rod, threaded jaws are forged as well. Both have standard openings of 13/16 inch and are drilled for AAR #10105 jaw pin. Their tang ends and pipe couplings are for standard 1 inch signal pipe applications.

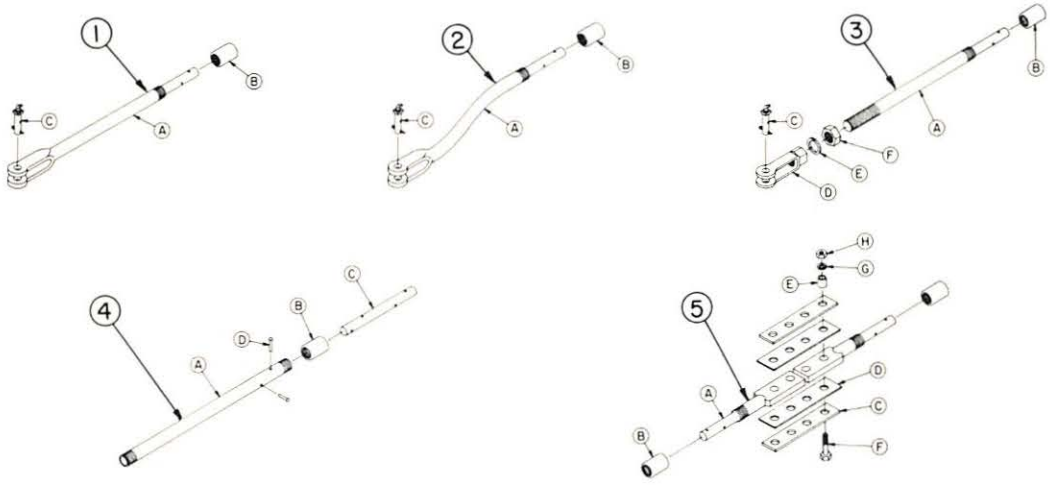
The cranks are available straight or angular, in two or three arm configurations.

Safetran's Plunger Lock assures positive locking through its 2 x 3/4 inch steel plunger. An alemite fitting is provided for lubrication to assure smooth movement of the plunger.

Using combinations of lock rods, lock plates, and lugs, lock rod assemblies can be furnished for any switching device. For complete lock rod assemblies, and application drawing and/or complete specifications of the switching device should be furnished with your order or inquiry.

Safetran Adjustable Links are fabricated from hot rolled steel, available in any length with any offset(s) to meet your specific requirements. All rods are normalized before bending for added strength. All integral clevises are forged from the rod, whereas threaded jaws are castings. Both have standard openings of 13/16 of an inch and are drilled for AAR #10105 jaw pin. The screw jaw used on the adjusting links is AAR #10164, also drilled for AAR #10105 jaw pin. Standard 1-1/4"—7 round threads are used; they may constitute any desired length of the rod.

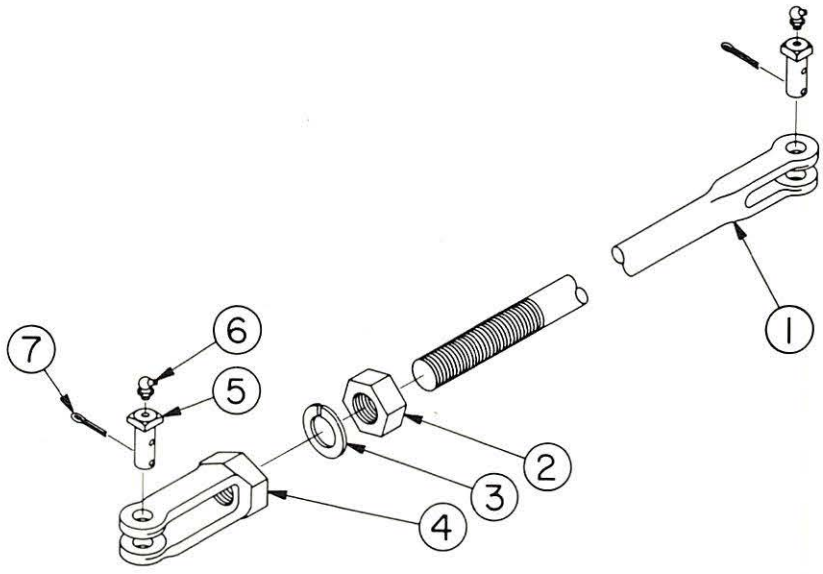
TANG END RODS
ORDERING INFORMATION/REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number
1	Rod, Tang End, Straight (AAR# 10181)	1	110229-1X
	Includes: A. Rod, Tang End	1	110229-1
	B. Coupling	1	5256-SG
	C. Pin, Jaw	1	110202-X
2	Rod, Tang End, Offset (AAR# 10182)	1	110229-13X
	Includes: A. Rod, Tang End	1	110229-30
	B. Coupling	1	5256-SG
	C. Pin, Jaw	1	110202-X
3	Rod, Tang End, with Screw Jaw (AAR# 10199)	1	110229-23X
	Includes: A. Rod, Tang End	1	110229-22
	B. Coupling	1	5256-SG
	C. Pin, Jaw	1	110202-X
	D. Jaw, Screw	1	110219-8
	E. Washer, Spring Lock, M, 1-1/4"	1	1819-MS
	F. Nut, Hex, 1-1/4"	1	2211-SC
4	Coupling, Signal Pipe (AAR# 10155)	1	110455-X
	Includes: A. Pipe, 1" x 21'	1	110455
	B. Coupling	1	5256-SG
	C. Plug	1	110229-28
	D. Rivet, Button Head, 1/4" x 1.75"	2	3652-BSC
5	Rod, Pipeline Insulation (AAR# 10949)	1	110229-7X
	Includes: A. Rod, Tang End	2	110229
	B. Coupling	2	5256-SG
	C. Plate, Splice	2	110281-1
	D. Plate, Insulation	2	110282-5
	E. Bushing, Insulation	4	110283-1
	F. Cap Screw, Hex Head, 5/8"-11 x 2.75"	4	4243-HS
	G. Washer, Spring Lock, H, 5/8"	4	1814-HS
	H. Nut, Hex, 5/8"-11	4	2206-5

ADJUSTABLE LINK REPLACEMENT PARTS

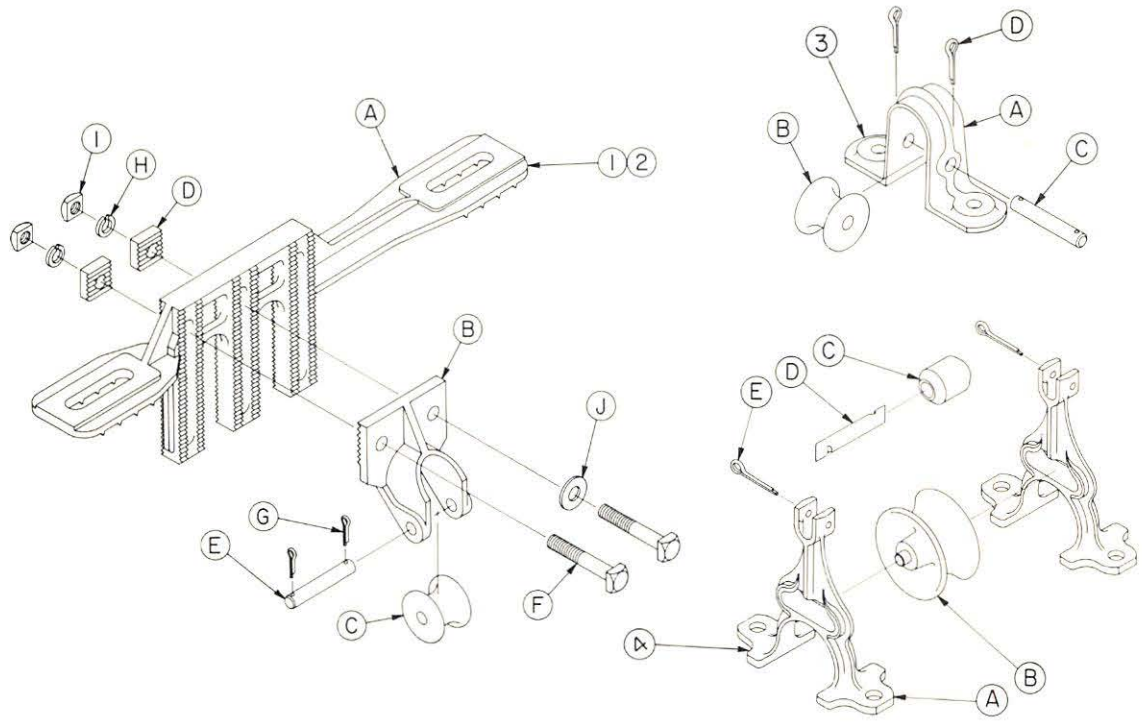


To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Rod, Adjusting Link	1	Specify*
2	Nut, Hex, 1-1/4″-7	1	2211-SC
3	Washer, Spring Lock, M, 1-1/4″	1	1819-MS
4	Jaw, Screw, AAR #10164	1	110219-8
5	Pin, Jaw, AAR #10105	2	110202
6	Fitting, Alemite, 45°	2	110445-1
7	Pin, Cotter, 3/16″ x 1.5″	2	1035-S

*For Adjusting Link Rod to be replaced, specify length of rod, and length of rod to be threaded. A drawing and/or complete specifications may be submitted with your order or inquiry.

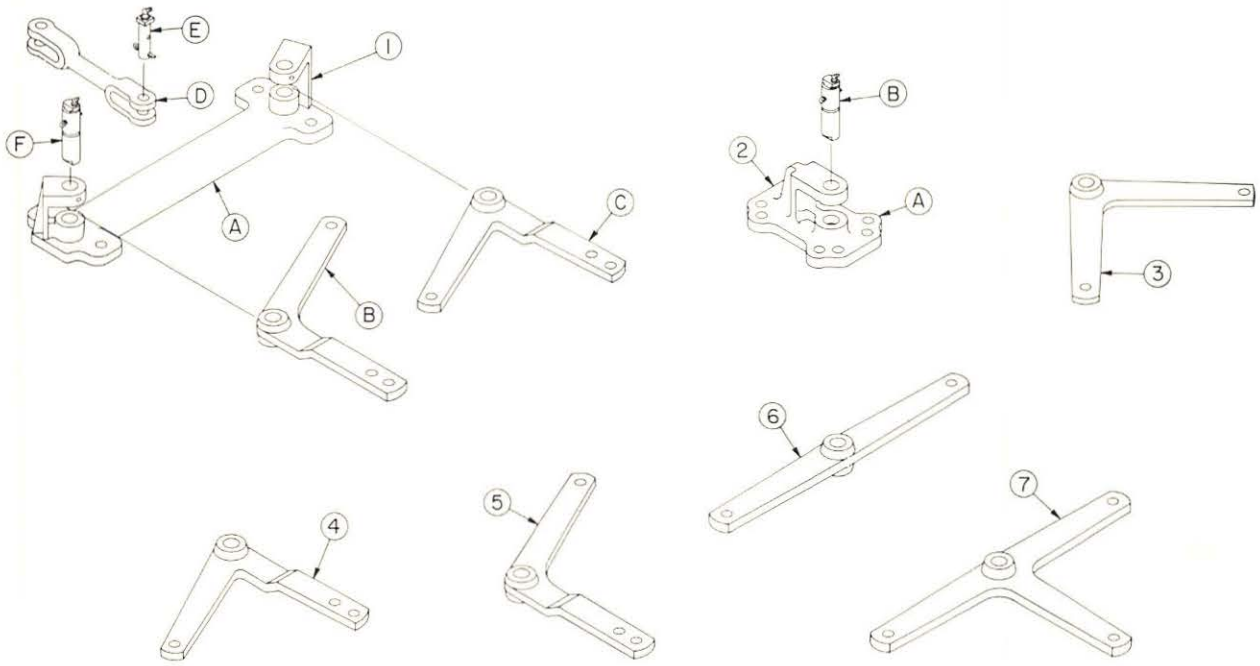
PIPE CARRIERS
ORDERING INFORMATION/REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number
1	One Way Traverse Pipe Carrier	1	111411-1X
2	Two Way Traverse Pipe Carrier	1	111411-2X
	Includes: A. Support	1	111411-3
	B. Hangar	1	111411-4
	C. Sheave	1	111411-6
	D. Washer, Binding	2	111411-5
	E. Pin	1	111411-7
	F. Machine Bolt, Square Head, 1/2″-13 x 3″	2	7997-SCO
	G. Pin, Cotter, 3/16″ x 1″	2	1033-SC
	H. Washer, Spring Lock, M, 1/2″	2	1812-MSC
	I. Nut, Square, 1/2″-13	2	2404-SC
	J. Washer, Flat, 1/2″	1	1730-SC
3	One Way Pipe Carrier (AAR# 10746)	1	110225-5X
	Includes: A. Stand, Pipe Carrier	1	110225-1
	B. Roller	1	110227-1
	C. Pin, Roller	1	110226-4
	D. Pin, Cotter, 3/16″ x 1-1/2″	2	1035-SC
4	One Way Pipe Carrier (AAR# 10841)	1	110228-X
	Includes: A. Side, Pipe Carrier	2	110228
	B. Roller, Bottom	1	110226-X
	C. Roller, Top	1	110227
	D. Pin	1	110226-3
	E. Pin, Cotter, 3/16″ x 1-1/2″	1	1035-SC

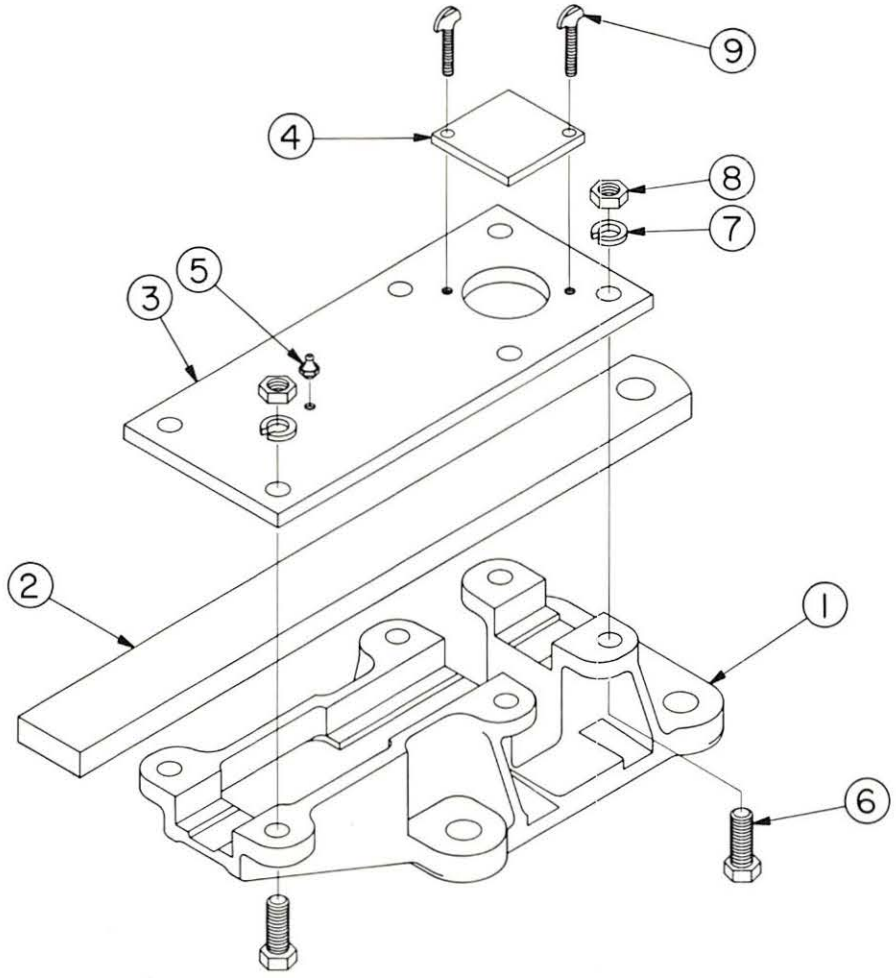
COMPENSATOR, CRANKSTAND, AND CRANKS ORDERING INFORMATION/REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number
1	One Way Horizontal Pipe Compensator (AAR# 10144)	1	110256-1X
	Includes: A. Stand, Compensator	1	110256-22
	B. Crank, Obtuse, 120°, (AAR# 10132)	1	110257-5
	C. Crank, Acute, 60°, (AAR# 10135)	1	110257-6
	D. Link, Compensator	1	110258-2
	E. Pin, Jaw (AAR# 10105)	2	110202-X
	F. Pin, Crank (AAR# 10101)	2	110255-X
2	Crank Stand (AAR# 10082)	1	110256-X
	(Includes) A. Stand, Crank (AAR# 10081)	1	110256-21
	B. Pin, Crank (AAR# 10101)	1	110255-X
3	Crank, Right Angle, 7″ x 7″ (AAR# 10074)	1	110257-170
	Crank, Right Angle, 9″ x 9″ (AAR# 10075)	1	110257-19
	Crank, Right Angle, 11-3/4″ x 11-3/4″ (AAR# 10076)	1	110257-7
	Crank, Right Angle, 14-1/2″ x 14-1/2″ (AAR# 10077)	1	110257-11
4	Crank, Acute Angle, 60°, 10″ x 13″ (AAR# 10132)	1	110257-5
5	Crank, Obtuse Angle, 120°, 10″ x 13″ (AAR# 10135)	1	110257-6
6	Crank, Straight, 9″ x 9″ (AAR# 10072)	1	110257-31
	Crank, Straight, 11-3/4″ x 11-3/4″ (AAR# 10073)	1	110257-32
7	Crank, Three Arm, 11-3/4″ x 11-3/4″ (AAR# 10071)	1	110257-15

PLUNGER LOCK



For Complete Assembly, Order Part Number 110254-4X.

To Order: Specify Description and Part Number.

Item Number	Description	Quantity Required	Part Number
1	Stand, Plunger	1	110254-4
2	Bar, Plunger	1	110254-5
3	Door, Plunger	1	110254-2
4	Plate, Door Cover	1	110254-3
7	Fitting, Alemite	1	110333-8A
6	Cap Screw, Hex Head, 1/2″-13 x 1.5″	6	4168-HSC
7	Washer, Spring Lock, M, 1/2″	6	1812-MS
8	Nut, Hex, 1/2″-13	6	2204-S
9	Screw, Thumb, 1/4″-20 x .625″	2	7059

Section M

Safetran

TOOLS AND ACCESSORIES

SECTION M

CONTENTS

Product	Subsection
Terminal Wrenches	1
Bonding Drill — Model 575-1	2
Bonding Drill — Model 650	3
Grinder — Model SL-6	4
Railbond Grinder — Model 300 AY	5
One Man Dolly — Model M-1000	6
Miscellaneous Tools and Accessories	7
Speaker Phones	8

Safetran

INSULATED TERMINAL WRENCHES

- PLASTIC NONSLIP HANDLE PROVIDES A SURE GRIP
- AVAILABLE IN A VARIETY OF LENGTHS
- AVAILABLE PARTIALLY OR COMPLETELY INSULATED

Safetran Insulated Terminal Wrenches are designed for use with AAR # 10706 (1/2 inch) terminal nuts. They are available in a variety of lengths with or without insulating sleeve extending completely over socket. Construction of these wrenches consists of nickel plated hex steel body embedded in a clear plastic handle. Safetran Insulated Terminal Wrenches are also available for AAR # 10707 (7/16 inch) terminal nuts. Construction is of steel body embedded in a plastic handle. The plastic handle provides both a sure grip and added safety for the user.

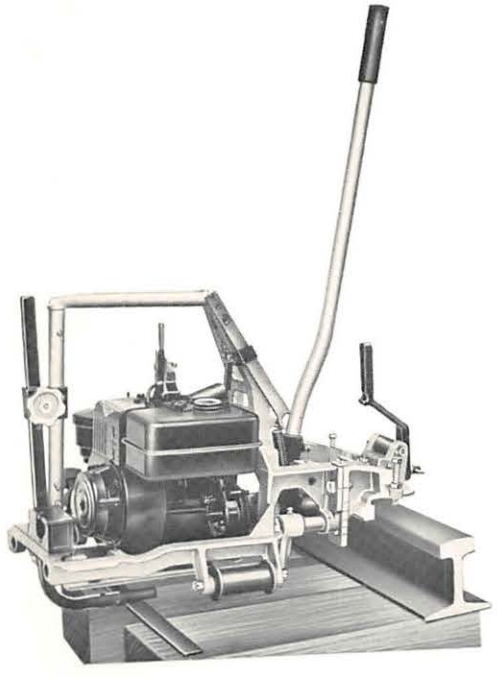
To Order: Specify Description and Part Number.

Description	Total Length Of Wrench In Inches	Length of Insulated Socket	Part Number
Insulated Terminal Wrench, 1/2"	4-1/2	3/4	032619-5X
Insulated Terminal Wrench, 1/2"	4-1/2	None	032619-1X
Insulated Terminal Wrench, 1/2"	6-1/2	2-3/4	032619-6X
Insulated Terminal Wrench, 1/2"	6-1/2	None	023619-3X
Insulated Terminal Wrench, 7/16"	7-1/4	None	032619-7A

Safetran

POWER BONDING DRILL

MODEL 575-1



- **MAINTENANCE WORK AND LIMITED PRODUCTION DRILLING CAPABILITIES**
- **BALL BEARING ROLLERS PROVIDE EASY TRANSPORT ON RAIL**
- **EASILY ADJUSTED FOR HEAD OR WEB OF RAIL DRILLING**

The Model 575-1 Power Bonding Drill is of cast aluminum construction weighing 68 pounds. While it is easily handled for maintenance work, it is capable of limited production drilling as well. It can be easily adjusted to either the head or web of rail for stranpins, channel pins, rail connection plugs, and various clamps. The weight of the machine is balanced on ball bearing rollers which provide an easy advance from one rail joint to the next.

A simple, rugged clamp securely fastens the machine to the rail for drilling, and affords a quick release for removal.

An adjustable foot gives solid support to the rear of the machine.

Standard 3/8 inch and 9/32 inch diameter bonding bits are easily installed or removed from the collets, which automatically center themselves in the chuck.

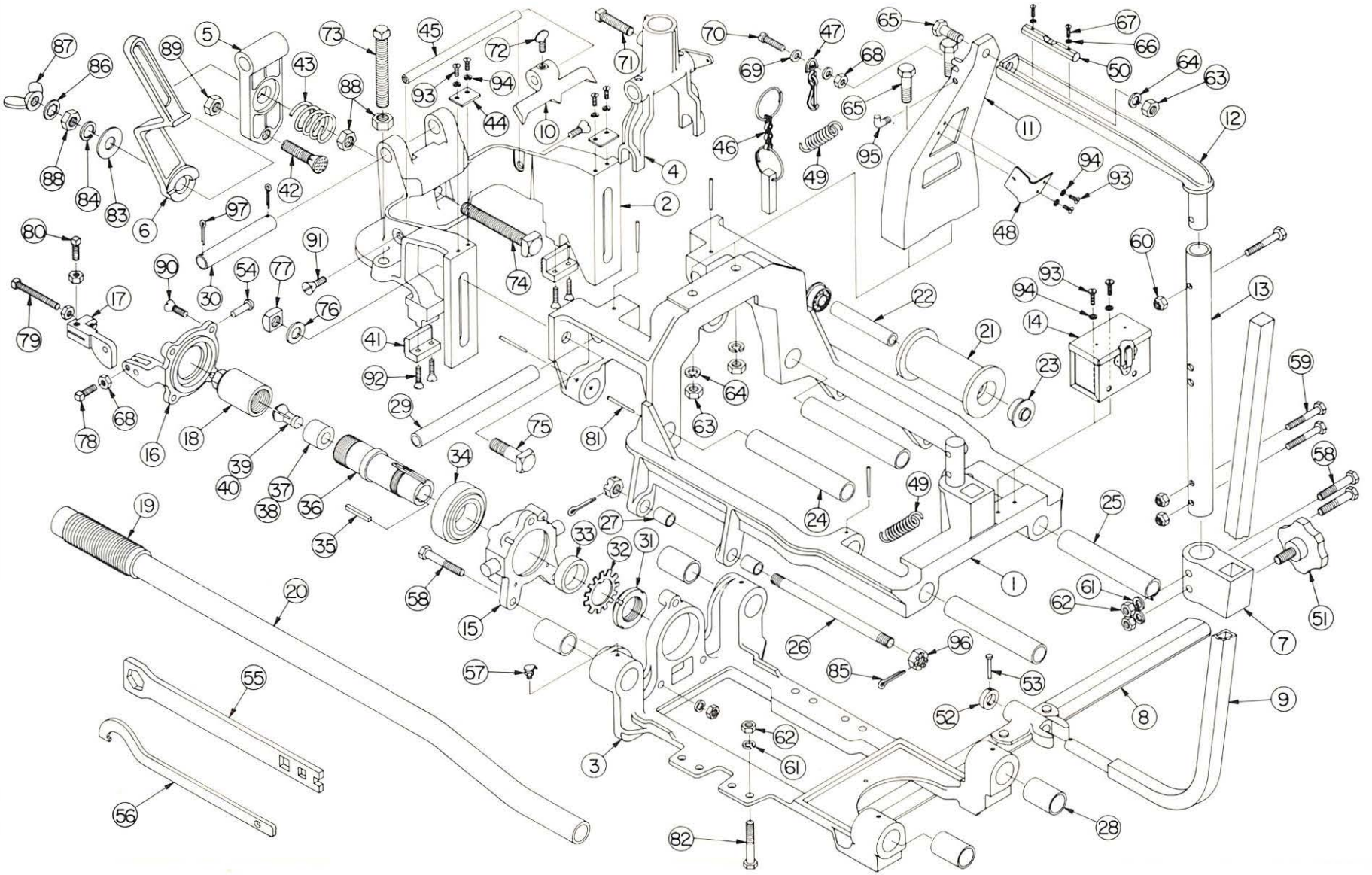
The chuck is directly driven through a self contained gear reduction by a 3 HP, 4 cycle, air cooled gasoline engine.

A guage near the bit, in full view of the operator, allows for proper spacing of the bond holes. The 575-1 is also equipped with an adjustable depth guage and a built in level to assure correct drilling depth and angle. A manual feed lever with high force ratio provides drill feed with ease.

An adjustment wrench, designed to fit all adjusting nuts on the machine, is provided in addition to a spanner wrench to hold the spindle while tightening the collet.

Also included is a 3/4 inch chuck extension plug for drilling through the web of the rail, or to allow use of shorter, resharpened bits. To enable the use of even shorter drill bits, a 1 inch chuck extension plug is available.

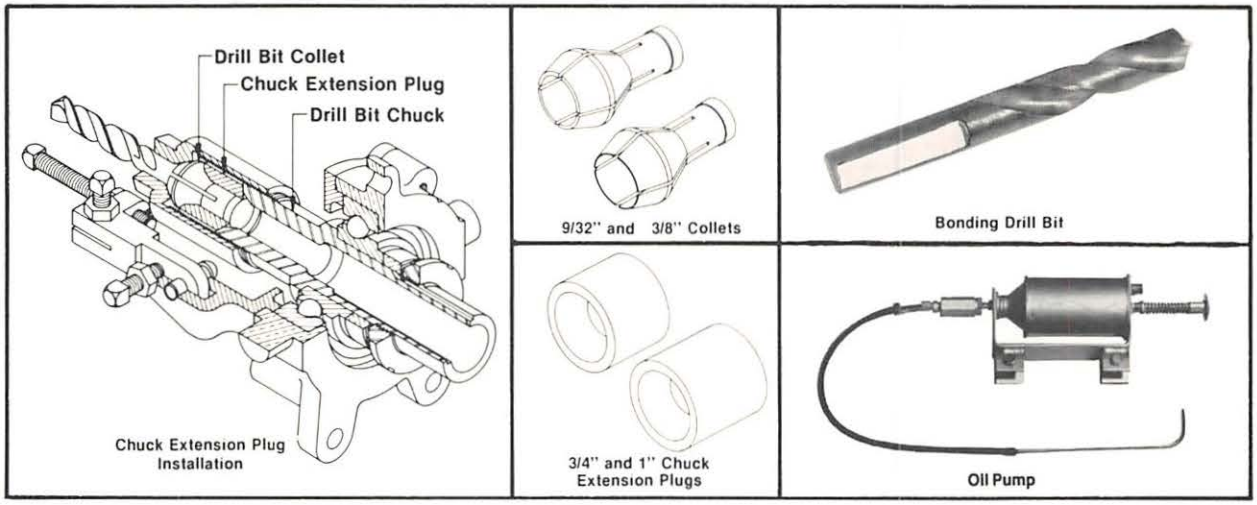
MODEL 575-1 POWER BONDING DRILL ASSEMBLY AND REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Frame	1	080575-145	50	Level	1	080650-58
2	Bracket	1	080575-135	51	Wheel, Hand	1	080575-50X
3	Support, Engine	1	080575-142AX	52	Collar, Elevating Rod Pin	1	080575-34
4	Yoke, Drilling Lever	1	080575-131	53	Pin, Taper, #1 x 1"	1	1311
5	Clamp, Rail	1	080575-141	54	Rivet, Round Head, .25" x 1.25"	1	3648-RSC
6	Lever	1	080575-10	55	Wrench, Adjustment	1	080575-11
7	Bracket, Elevating Rod	1	080575-130	56	Wrench, Spanner	1	080575-108
8	Plate, Foot	1	080575-44X	57	Cup, Oil	4	080345-90
9	Rod, Elevating	1	080575-42X	58	Cap Screw, Hex Head, 5/16"-18 x 1.75"	5	4049-HSC
10	Indicator, Bond Hole	1	080615	59	Cap Screw, Hex Head, 1/4"-20 x 1.5"	3	4006-HSC
11	Bracket, Carrying Handle	1	080575-136	60	Nut, Lock, 1/4"-20	3	2319-FLSC
12	Handle, Carrying	1	080575-149	61	Washer, Spring Lock, L, 5/16"	9	1809-MSC
13	Post, Elevating Rod Bracket	1	080575-45	62	Nut, Hex, 5/16"-18	9	2102-SC
14	Box, Tool	1	080575-102	63	Nut, Hex, 3/8"-16	3	2104-SC
15	Housing, Bearing	1	080575-133	64	Washer, Spring Lock, L, 3/8"	3	1810-MSC
16	Cap, Bearing Housing	1	080575-120	65	Cap Screw, Hex Head, 3/8"-16 x 1.25"	3	4089-HSC
17	Stop, Drill Bit	1	080575-134	66	Washer, Spring Lock, M, #6	2	1804-MSC
18	Cap, Drill Bit Chuck	1	080575-9	67	Machine Screw, Round Head, #6-32x.625"	2	2561-RSC
19	Grip, Rubber	1	080575-56	68	Nut, Hex, 1/4"-20	4	2150-SC
20	Lever, Drilling	1	080575-43A	69	Washer, Flat, 1/4"	2	1717-SC
21	Roller	2	080575-156	70	Cap Screw, Fillister Head, 1/4"-20x.875"	2	2659-RSC
22	Spacer, Bearing	2	080575-29	71	Set Screw, Square Head, 3/8"-16x1.5"	1	4934-SC
23	Bearing	4	080575-28	72	Screw, Thumb, 1/4"-20 x .625"	1	7059
24	Shaft, Engine Support (Front)	2	080575-27	73	Set Screw, Square Head, 1/2"-13 x 3"	2	4969-S
25	Shaft, Engine Support (Rear)	2	080575-26	74	Bolt, Rail Clamp	1	080345-27X
26	Shaft, Roller	2	080575-32	75	Machine Bolt, Square Head, 1/2"-13x1.5"	2	7991-SCO
27	Collar, Bearing Clamp	4	080575-31	76	Washer, Flat, 1/2"	2	1730-SC
28	Bushing, Engine Support	4	080575-35	77	Nut, Square, 1/2"-13	2	2404-SC
29	Shaft, Drilling Lever Yoke	1	080575-46	78	Set Screw, Square Head, 1/4"-20 x .625"	1	4902-SC
30	Pin	1	080575-20	79	Set Screw, Square Head, 1/4"-20 x 2.25"	1	4910-SC
31	Nut, Lock	1	2385-S	80	Set Screw, Square Head, 1/4"-20 x .875"	1	4904-SC
32	Washer, Lock	1	1962-S	81	Pin, Taper, #1 x 1.5"	6	1314
33	Collar, Bearing	1	080575-22	82	Cap Screw, Hex Head, 5/16"-18 x 1.75"	9	4049-HSC
34	Bearing	1	080575-15	83	Washer, Flat, 1/2"	2	1730-SC
35	Key, Drill Bit Chuck	1	080575-18	84	Washer, Spring Lock, M, 1/2"	2	1812-MSC
36	Chuck, Drill Bit	1	080575-8A	85	Pin, Cotter 3/32" x 1"	4	1009-SC
37	Plug, Drill Extension, 3/4"	1	080575-63	86	Washer, Shakeproof Lock, I, 1/2"	1	1862-ISC
38	Plug, Drill Extension, 1"	1	080575-105	87	Nut, Wing, 1/2"-13	1	2063-SC
39	Collet, 3/8"	1	080575-14	88	Nut, Hex, 1/2"-13	2	2158-SC
40	Collet, 9/32"	1	080575-64	89	Nut, Hex, 7/16"-14	1	2106-SC
41	Plate	2	080575-60	90	Machine Screw, Flat Head, 1/4"-20 x .75"	4	2660-FSC
42	Screw, Adjusting (includes item 89)	1	080345-163X	91	Machine Screw, Flat Head, 5/16"-18 x 1"	2	2686-FSC
43	Spring	1	080345-34	92	Machine Screw, Flat Head, #10-32 x 1"	4	2620-FSC
44	Plate, Frame Stop	2	080575-61	93	Machine Screw, Round Head, #10-32 x .5"	8	2616-RSC
45	Shaft, Bond Hole Indicator	1	080575-21	94	Washer, Spring Lock, M, #10	8	1806-MSC
46	Gauge, Drill Bit	1	080575-25A	95	Hook, Wrench	1	080575-57
47	Hook, Snap	1	080575-48B	96	Nut, Slotted Hex, 7/16"-14	4	2377-SC
48	Clip, Wrench	1	080575-59	97	Pin, Cotter, .125" x 1.25"	2	1017-SC
49	Spring, Restoring	2	080575-52	98	Engine (Not Shown)	1	080575-104

MODEL 575-1 POWER BONDING DRILL ORDERING INFORMATION



The chuck on the Model 575-1 utilizes an optional chuck extension plug to allow use of shorter, resharpened drill bits.

Experience has proven that a drill bit 1/2 inch or more shorter than the standard length bit may break in service if not used with a chuck extension plug. A 3/4 inch chuck extension, used for drilling through the web of the rail as well as to allow use of shorter, resharpened bits, is furnished as standard equipment with the machine. However, a 1 inch chuck extension plug is also available to allow use of even shorter drill bits.

Also available is a collet to allow use of 9/32 inch drill bits.

Safetran bonding drill bits are designed specifically for drilling rail. They improve drill performance, and eliminate or minimize the difficulties usually encountered in drilling rail. They are made of tough steel under processes that produce the best performing and longest lasting bits without premium cost.

A hand operated oil pump which mounts directly to Power Bonding Drill 575-1 for the purpose of prolonging the useful life of drill bits is available. The pump enables the spraying of cutting lubricant onto the drill bit and rail during cutting operation which helps preserve the cutting edge of the bit.

To Order: Specify Description and Part Number.

Description	Part Number
Model 575-1 Power Bonding Drill	080575-146X
Chuck Extension Plug, 3/4" (furnished with machine)	080575-63
Chuck Extension Plug, 1"	080575-105
Collet for 3/8" Drill Bits (furnished with machine)	080575-14
Collet for 9/32" Drill Bits	080575-64
Drill Bit, 3/8", Flat Shank (for set screw type chuck)	080871-WF100
Oil Pump	B080550-NX

Safetran

HAND BONDING DRILL

MODEL 650

- **LIGHTWEIGHT, RUGGED TOOL EXCELLENT FOR MAINTENANCE WORK**
- **ADJUSTED TO EITHER HEAD OR WEB OF RAIL**
- **PROVIDED WITH DEPTH GUAGE AND BUILT-IN LEVEL**

Safetran Model 650 Hand Bonding Drill is a simple, economic, and rugged tool which is easily operated and maintained. Weighing only 16 pounds, the Model 650 is especially suited for maintenance work.

A simple, rugged clamp securely fastens the machine to the rail through the use of its chisel like rail grips. The lever and cam action of the clamp affords easy mounting and instant release for quick removal.

Once clamped to the rail, the drill is easily adjusted to either the head or web.

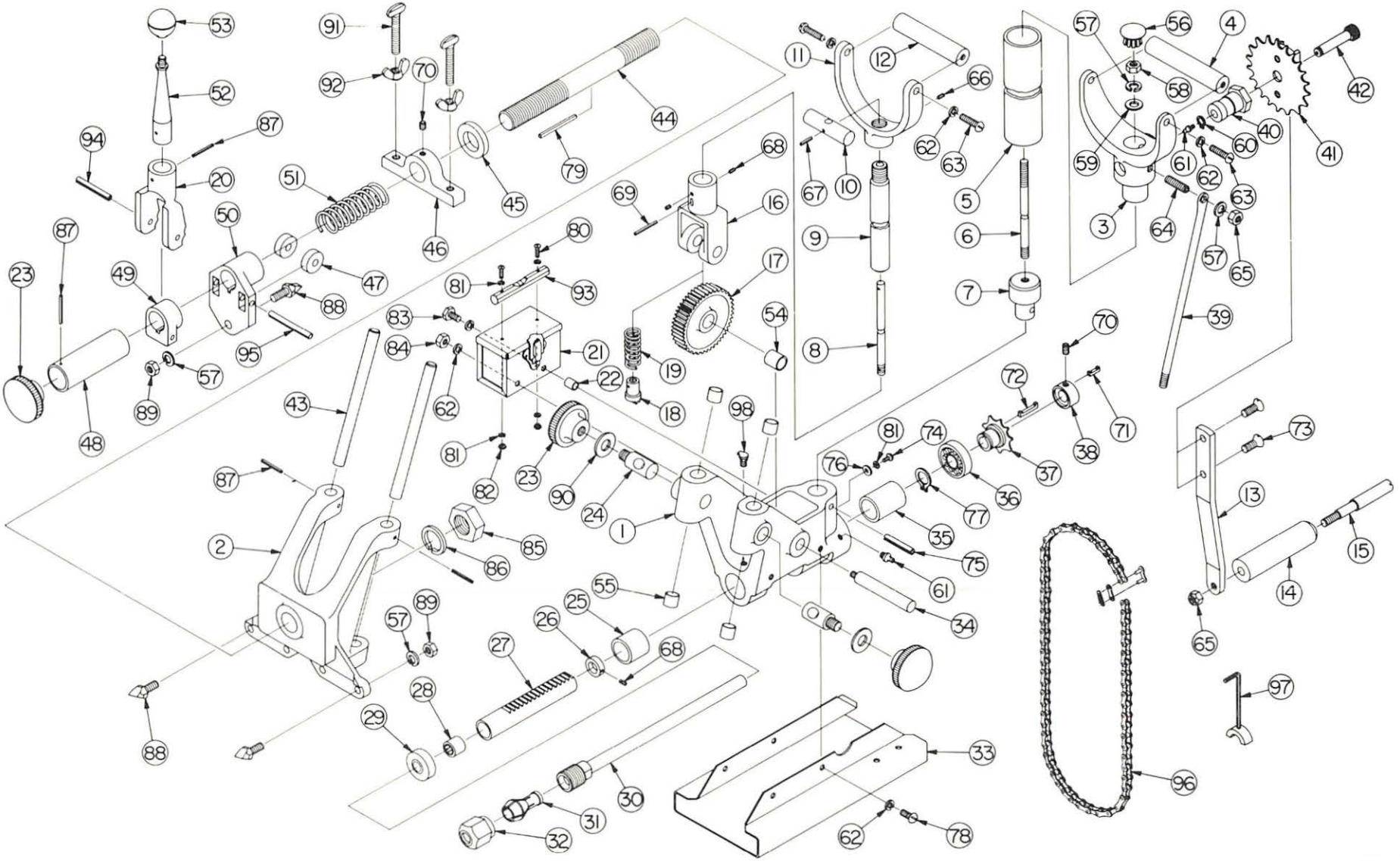
Standard 3/8 inch and 9/32 inch diameter bonding bits are easily installed or removed from the collets, which automatically center themselves in the chuck.

The chuck is driven by hand crank operated sprocket and chain.

The hand feed lever enables the operator to vary the feed for condition of bit, hardness of rail, etc.

An adjustable depth guage and built-in level assure correct drilling depth and angle.

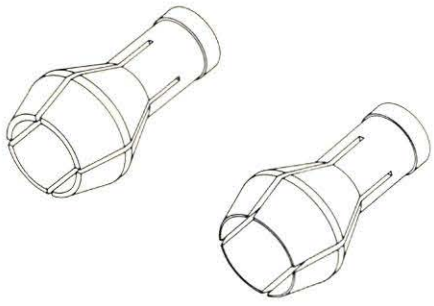
MODEL 650 HAND BONDING DRILL
ASSEMBLY AND REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number	Item Number	Description	Qty. Req'd.	Part Number
1	Frame, Main	1	080650-178	50	Arm	1	080650-18
2	Bracket, Elevating	1	080650-181	51	Spring, Rail Clamp	1	080650-22
3	Handle, Lever, Carry	1	080650-48	52	Lever, Rail Clamp	1	080650-15
4	Grip, Carry Handle	1	080650-50	53	Knob, Rail Clamp Lever	1	080650-16
5	Tube, Main Frame	1	080650-46A	54	Bushing	1	080650-92
6	Rod, Main Frame Tube	1	080650-45	55	Bushing, Main Frame Elevating	4	080650-40
7	Stud, Main Frame	1	080650-44	56	Plug, Main Frame Tube	1	080650-49
8	Rod, Latch	1	080650-35B	57	Washer, Spring Lock, M, 5/16"	6	1809-MSC
9	Rod	1	080650-34	58	Nut, Hex Jamb, 5/16"-18	1	2152-SC
10	Handle, Latch Adjusting	1	080650-35A	59	Washer, Flat, 5/16"	1	1724-SC
11	Handle, Feed Lever	1	080650-33	60	Ring, Snap	1	7569
12	Grip, Feed Lever Handle	1	080650-32	61	Fitting, Grease, 1/8" x 1/4"	2	080650-93
13	Arm, Crank	1	080650-54	62	Washer, Spring Lock, M, 1/4"	8	1808-MSC
14	Handle, Crank Arm	1	080650-56	63	Machine Screw, Round Head, 1/4"-20 x 1"	4	2662-RSC
15	Stud, Crank Arm Handle	1	080650-55	64	Set Screw, Socket Head, 5/16"-18 x 1"	2	4636-SC
16	Socket	1	080650-182	65	Nut, Esna, 5/16"-18	1	2374-SC
17	Gear, Feed	1	080650-39	66	Set Screw, Socket Head, #10-32 x .187"	1	4589-SC
18	Latch	1	080650-37	67	Pin, Roll, 1/8" x 1-5/8"	1	1552-SC
19	Spring, Latch	1	083507	68	Set Screw, Socket Head, #8-32 x .375"	3	4560-SC
20	Socket, Rail Clamp Lever	1	080650-183	69	Pin, Roll, 1/8" x 1-3/8"	1	1561-SC
21	Box, Tool	1	080575-102	70	Set Screw, Socket Head, 1/4"-20 x .375"	2	4603-SC
22	Spacer, Tool Box	1	080650-164	71	Key, Stop Collar	1	080650-63
23	Knob, Stud Clamp	3	080650-11	72	Key, Spindle	1	080650-61
24	Stud, Main Frame Clamp	2	080650-31	73	Machine Screw, Flat Head, 5/16"-18 x 1"	2	2686-FSC
25	Bushing	1	080650-42	74	Machine Screw, Round Head, #10-32 x .3125"	1	2613-RSC
26	Collar, Spindle	1	080650-30	75	Pin, Roll, 1/4" x 1-1/2"	1	1636-SC
27	Rack, Spindle Feed	1	080650-29	76	Washer, Flat, 3/16"	1	1712-SC
28	Bearing, Needle	1	080650-94	77	Ring, Retaining	1	7568
29	Bearing, Thrust	1	080609-20	78	Machine Screw, Round Head, 1/4"-20 x .5"	4	2657-RSC
30	Collet, Drill Spindle	1	080650-66	79	Key, Rail Clamp Shaft	1	080650-21
31	Collet, 3/8"	1	080575-14	80	Machine Screw, Round Head, #10-32 x .5"	2	2616-RSC
32	Cap, Chuck	1	080345-166	81	Washer, Spring Lock, M, #10	5	1806-MSC
33	Guard, Drill and Sprocket	1	080650-165	82	Nut, Hex, #10-32	2	2015-SC
34	Pin	1	080650-74A	83	Cap Screw, Hex Head, 1/4"-20 x 1/2"	1	4000-HSC
35	Bushing	1	080650-43	84	Nut, Hex, 1/4"-20	1	2100-SC
36	Bearing, Radial	1	080650-60	85	Nut, Hex Jamb, 7/8"-14	1	2117-SC
37	Sprocket, Drive	1	080650-62	86	Washer, Spring Lock, M, 7/8"	1	1816-MSC
38	Collar, Stop	1	080650-64	87	Pin Roll, 1/8" x 1-1/8"	4	1559-SC
39	Rod, Brace	2	080650-47	88	Clamp, Rail	3	080650-19
40	Bushing, Drive Sprocket Stud	1	080650-51	89	Nut, Hex, 5/16"-18	3	2321-FLSC
41	Sprocket, Drive	1	080650-52	90	Washer, Flat, 7/16"	2	1729-C
42	Stud, Drive Sprocket	1	080650-53	91	Screw, Thumb, 5/16"-18 x 2"	2	7052
43	Rod, Elevating Guide	2	080650-26	92	Nut, Wing, 5/16"	2	2057-SC
44	Shaft, Rail Clamp	1	080650-20	93	Level	1	080650-58
45	Spacer, Rail Head Rest	1	080650-167	94	Pin, Roll, 1/4" x 1-3/4"	1	1638-SC
46	Rest, Rail Head	1	080650-23A	95	Pin, Roll, 1/4" x 2-3/4"	1	1641-SC
47	Roller, Arm	2	080650-17	96	Chain	1	080650-57
48	Sleeve, Adjusting Rail Clamp	1	080650-12	97	Wrench, Gauge & Socket	1	080650-65X
49	Sleeve, Rail Clamp Lever	1	080650-13	98	Cover, Oil Hole	1	080345-90

MODEL 650 HAND BONDING DRILL ORDERING INFORMATION



9/32" and
3/8" Collets

Bonding Drill Bit

The Model 650 is equipped with a collet for standard 3/8 inch bonding bits; however, a 9/32 inch collet is also available.

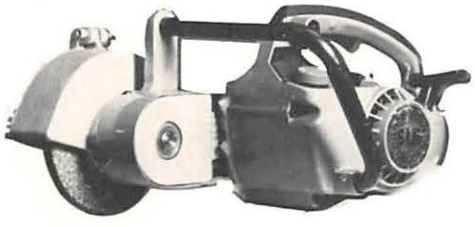
Safetran bonding drill bits are designed specifically for drilling use. They improve drill performance, and eliminate or minimize the difficulties usually encountered in drilling rail. They are made of tough steel under processes that produce the best performing and longest lasting bits without premium cost.

To Order: Specify Description and Part Number.

Description	Part Number
Model 650 Hand Bonding Drill	080650-2X
Collet for 3/8" Drill Bits (furnished with machine)	080575-14
Collet for 9/32" Drill Bits	080575-64
Drill Bit, 3/8", Flat Shank (for set screw type chuck)	080871-WF100

PORTABLE GRINDER

MODEL SL-6



Model SL-6 Portable Grinder
013075-X

- **ALL PURPOSE GRINDER FOR SIGNAL USE**
- **TWO HANDLES AFFORD COMPLETE CONTROL**
- **HEAVY DUTY CONSTRUCTION YET WEIGHS ONLY 16 POUNDS**

The Model SL-6 is a lightweight, portable all purpose grinder. It is designed for grinding switch points, stock rails, rail welds, and pre-weld grinding, as well as sharpening cutter blades, tools, etc.

Its single cylinder, two cycle engine turns a 6 inch diameter grinding wheel via V-belt drive. The grinding wheel is contained within a guard for the protection of the operator. The wheel is located so that the operator has a good view of the work area. The design of the SL-6 allows it to be used in grinding the web of the rail and in tight areas such as around frogs and switch points. The speed is limited to 4750 RPM maximum, while a centrifugal clutch allows the wheel to stop when the engine idles.

Its pistol grip throttle and wrap around handle afford excellent control.

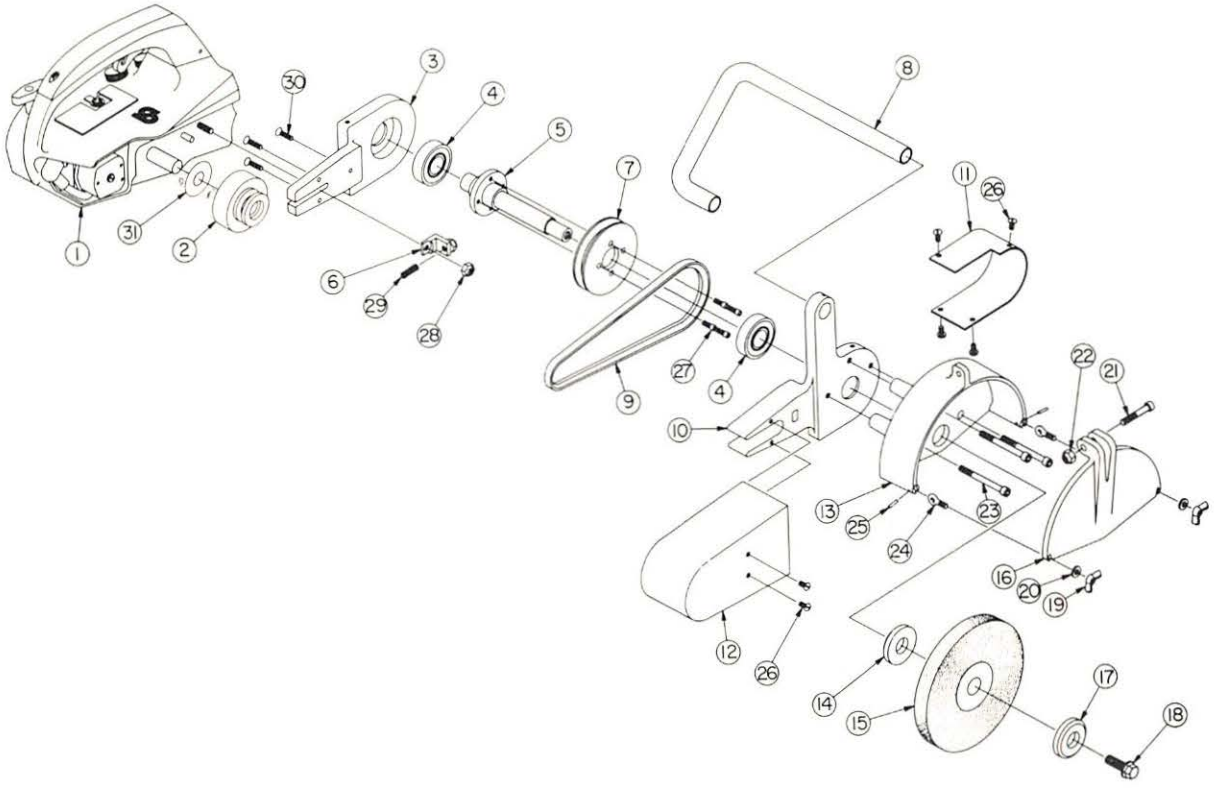
The Model SL-6 weighs only 16 pounds.

SPECIFICATIONS

Engine:	1.6 cubic inch two cycle air cooled gasoline engine. Recoil type starter. Governed @ 4750 RPM. 24 ounce fuel capacity.
Power Transfer:	V belt drive. Centrifugal clutch stops grinding wheel when engine idles.
Grinding Wheel:	Vitrified type, 6 inch diameter, 3/4 inch wide, 5/8 inch spindle, maximum speed of 4775 RPM.
Dimensions:	Length: 16 Inches — Height: 8 Inches. Weight: 16 Pounds. — Width: 14 Inches.

PORTABLE GRINDER

MODEL SL-6



To Order: Specify Description and Part Number.

Item No.	Description	Qty. Req'd.	Part Number	Item No.	Description	Qty. Req'd.	Part Number
1	Engine Model SL	1	013057-1	20	Washer Flat 3/16	2	1710-B
2	Pulley, Clutch	1	013084	21	Cap Screw Socket Head 1/4-20 x 1.5	1	4006-SSC
3	Support, Bearing	1	013077				
4	Bearing	2	070588	22	Nut Flex Lock 1/4-20	1	2319-FLSC
5	Shaft, Driven	1	013086				
6	Weldment Adjuster	1	013081-X	23	Cap Screw, Socket Head 1/4-20 x 1.25	3	4005-SSC
7	Pulley Driven	1	013085				
8	Handle, Long	1	013080	24	Screw, Thumb	2	013067
9	3L Belt	1	013087	25	Pin 3/32 x .625	2	1537-SC
10	Support Brg. Handle	1	013076	26	Machine Screw Truss Head #10-24 x .375	6	2590-TE
11	Guard, Pulley	1	013083				
12	Guard, Belt	1	013082	27	Cap Screw Socket Head #10-24 x .50	4	7737-SSC
13	Guard	1	013078				
14	Spacer 3/16 Thick	1	013059	28	Nut Hex 1/4 x 28	1	2101-SC
15	Wheel, Grinding	1	013088	29	Set Screw Socket Head 1/4-20 x .875	1	4608-SC
16	Cover, Wheel	1	013079				
17	Spacer 3/8" Thick	1	013059-1	30	Machine Screw Flat Head #10-24 x .875	3	2596-FSC
18	Hex Head w/Washer 7/16-20x1	1	4147-2				
19	Wing Nut #10-32 Nyloc	2	2054-1	31	Washer Brass	1	013068

Safetran

RAILBOND GRINDER

MODEL 300 AY

Safetran Model 300 AY Railbond Grinder allows for one man operation in an upright position. Not only is this position advantageous from a safety standpoint, but it alleviates operator fatigue as well.

The Model 300 AY Railbond Grinder is for use in grinding rail joints in preparation for welding bond. An attachment, supplied with the machine, allows the grinding wheel to be positioned vertically for head of rail grinding.

This grinder is constructed of tubular steel frame with insulated outrigger wheel. An elongated hole at the connection point of the outrigger allows for necessary angular adjustment of the grinding wheel to the rail.

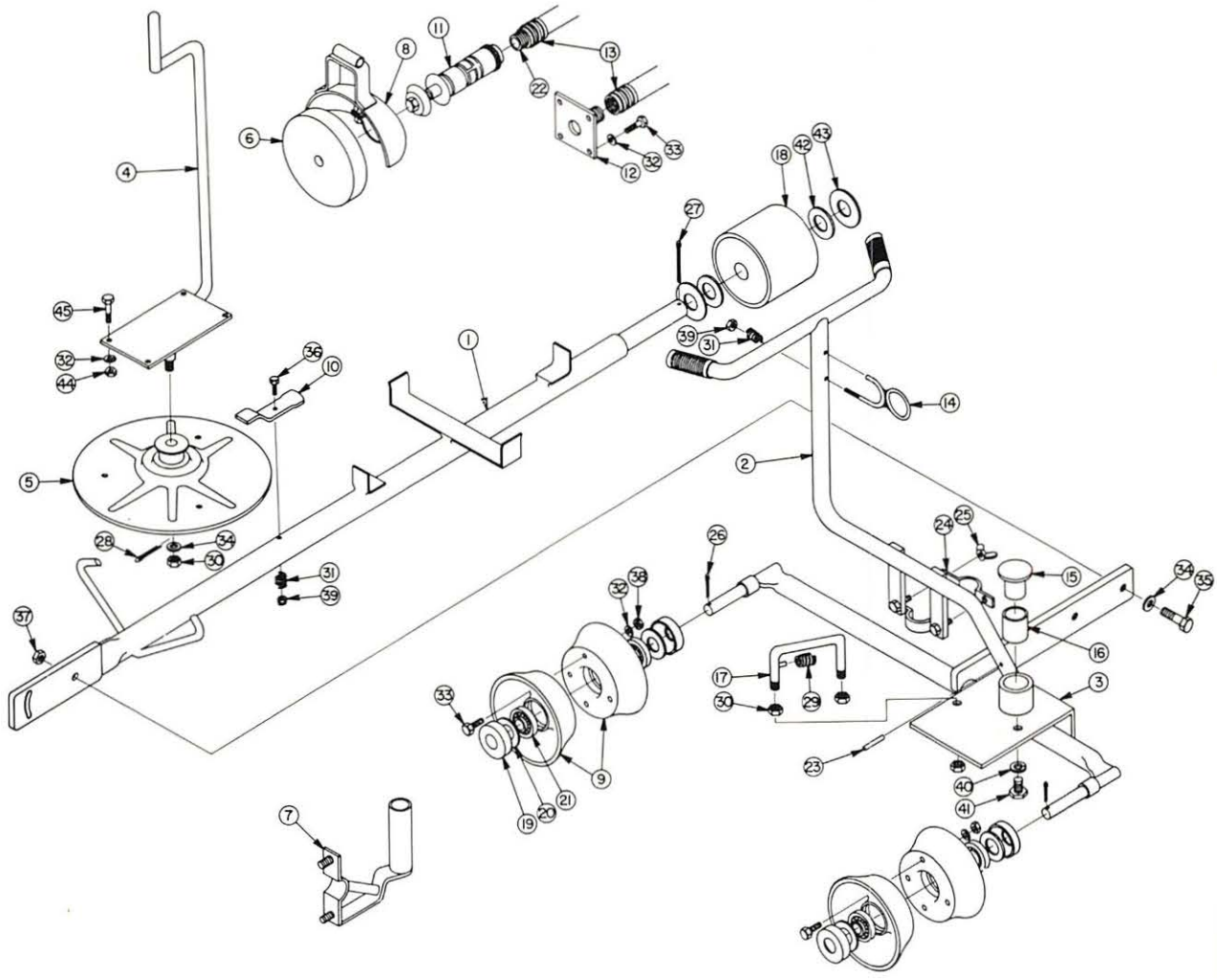
Its 6 inch grinding wheel is powered by a 4 HP air cooled gasoline engine through a 7 foot flexible shaft.

Sealed, prelubricated ball bearings in steel wheels allow for smooth advance on the rail.

A handle on the guard wheel; in combination with the flexible shaft, allows for general purpose grinding.

An optional tool box, which is mounted to the outrigger, is available.

MODEL 300 AY RAILBOND GRINDER ASSEMBLY



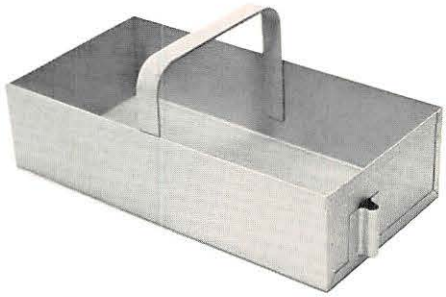
MODEL 300 AY RAILBOND GRINDER REPLACEMENT PARTS

For Complete Assembly, Order Part Number 140300-AY.
To Order: Specify Description and Part Number.

Item Number	Description	Qty. Req'd.	Part Number
1	Shaft, Outrigger	1	140319-X
2	Frame (includes Items #16, #23)	1	140309-RX
3	Frame, Dolly	1	140315-RX
4	Adapter, Motor	1	140342-X
5	Base	1	140344-P
6	Wheel, Grinding	1	140337-A
7	Attachment, Cut Off	1	140327-RX
8	Guard	1	140338-P
9	Half, Wheel	4	140203-3
10	Bar, Locking	1	140323
11	Spindle	1	140336-PAX
12	Coupling	1	140332-X
13	Housing, Flexible Shaft	1	140335-P
14	Hook, Shaft	1	140354
15	Trunnion	1	140301
16	Bushing	1	140304
17	Yoke	1	140305-X
18	Wheel, Wood	1	140202-X
19	Cover, Bearing	4	140203-6
20	Bearing, Felt	4	140203-7
21	Bearing, Ball	4	140203-4
22	Shaft, Flexible	1	140334-P
23	Pin, 1/4″ x 1-13/16″	1	140306-1
24	Clamp, Spindle	2	140312
25	Nut, Wing, 1/2″-13	4	2063-SC
26	Pin, Cotter, 3/16″ x 1″	2	1033-SC
27	Pin, Cotter, 3/16″ x 2.5″	1	1038-SC
28	Pin, Cotter, 3/32″ x 1″	1	1009-SC
29	Spring	1	140307
30	Nut, Hex, 1/2″-13	5	2158-SC
31	Spring, Compression	2	140322
32	Washer, Spring Lock, M, 5/16″	8	1809-MSC
33	Cap Screw, Hex Head, 5/16″-24 x .75″	8	4065-HSC
34	Washer, Flat, 1/2″	3	1755-C
35	Cap Screw, Hex Head, 1/2″-13 x 1.5″	2	4168-HSC
36	Cap Screw, Hex Head, 1/4″-20 x 2.75″	1	4011-HSC
37	Nut, Hex, 1/2″-13	2	2108-SC
38	Nut, Hex, 5/16″-24	8	2103-SC
39	Nut, Flex Lock, 1/4″-20	2	2319-FHSC
40	Washer, Spring Lock, M, 5/8″	1	1814-MSC
41	Cap Screw, Hex Head, 5/16″-18 x 1″	1	4253-HSC
42	Washer, Flat, 3/4″	2	1758-C
43	Washer, Flat, 1-1/4″	2	1762-C
44	Nut, Hex, 5/16″-18	4	2102-SC
45	Cap Screw, Hex Head, 5/16″-18 x 1.25″	4	4047-HSC

MODEL 300 AY RAILBOND GRINDER ACCESSORIES/ORDERING INFORMATION

Grinding Wheel



Tool Box

The grinding wheel, supplied with the Model 300 AY Railbond Grinder, measures 6 inches in diameter, 1 inch wide, and is rated at 4138 RPM.

The tool box is an open box with a handle, and is constructed of 20 gauge steel formed and welded together. This box is easily removed from outrigger on which it is mounted. The location of this box adds convenience and safety for the operator.

To Order: Specify Description and Part Number.

Description	Part Number
Model 300AY Railbond Grinder	140300-AY
Grinding Wheel	140337-A
Tool Box	083520-X

Safetran

ONE MAN DOLLY

M-1000

- TRANSPORTS LOADS UP TO 1000 POUNDS
- WHEELS ARE EQUIPPED WITH SEALED, PRELUBRICATED ROLLER BEARINGS
- LIGHTWEIGHT ALUMINUM-WEIGHS ONLY 37 POUNDS

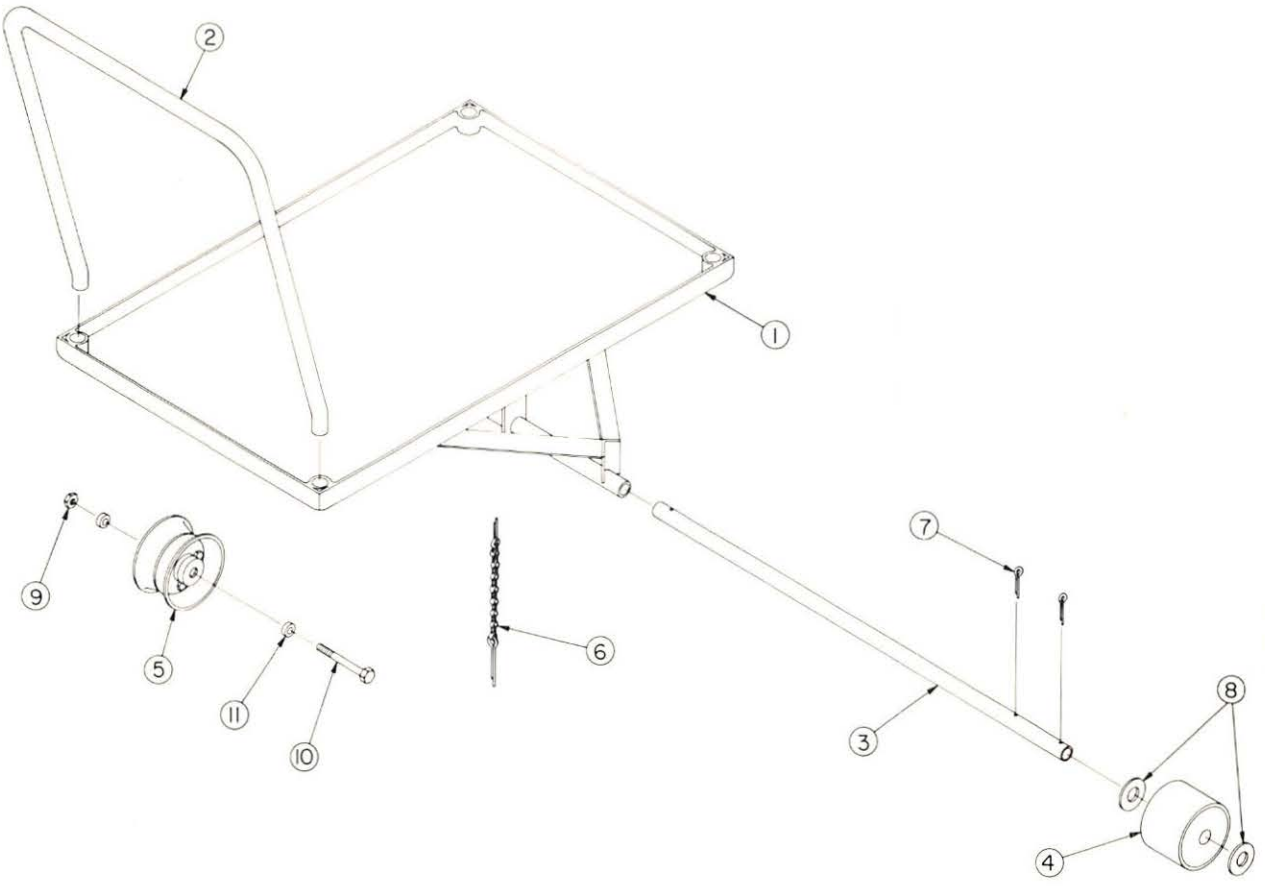
The Model M-1000 One Man Dolly is a lightweight aluminum all purpose vehicle with a sturdy welded frame capable of transporting loads up to 1000 pounds. Two double flanged 5 inch steel wheels with sealed and prelubricated roller bearings support the load.

The outboard wheel, also 5 inches in diameter, is laminated wood within a steel tire, so as not to shunt track. The outboard shaft extends 43 inches or can be removed for easy handling and storage. The heavy duty aluminum tray (27 inches by 42 inches) is positioned so that the load can be quickly and easily removed from the track. At a height of 33 inches above the rail, the handle is removable for use at either end of the dolly. Total weight of the entire unit is 37 pounds.

ORDERING INFORMATION

To Order: Specify Model M-1000 One Man Dolly, and Part Number 140200-ICX.

MODEL M-1000 ONE MAN DOLLY REPLACEMENT PARTS



To Order: Specify Description and Part Number.

Item Number	Description	Qt'y. Req'd.	Part Number
1	Tray	1	140200-2X
2	Handle	1	140213-1
3	Shaft, Outboard	1	140208-1
4	Wheel, Outboard	1	140202-1X
5	Wheel, Steel	2	140203-1X
6	Pin, Lock	1	140214-1X
7	Pin, Cotter, 3/16″ x 2″	2	1037-SC
8	Washer, Flat, 1-1/4″	2	1762-C
9	Nut, Flex Lock, 3/4″-16	2	2334-TLSC
10	Cap Screw, Hex Head, 3/4″-16 x 5″	2	4301-HSC
11	Spacer, Wheel	4	140211-2

Safetran

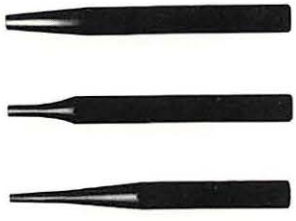
MISCELLANEOUS TOOLS AND LUBRICANTS

Cable Sheath Cutter

Model M
Switch Obstruction Gauge

Model L
Switch Obstruction Gauge

Switch Adjusting Wrenches



Starting Punches

Switch Point Clamp

Semaphore Oil

No Oxide Grease

Safetran Cable Sheath Cutter allows for a quick and precise cut through the outer sheath of cable without damage to the insulation of the individual conductors within. Calibrated with reference marks, the blade is adjustable for any thickness of cable sheath. The blade is adjustable for longitudinal or circumferential cuts.

Safetran Switch Obstruction Gauges allow for one man to operate the switch and make circuit controller adjustment without dislodging the gauge. Their surfaces are machined for accurary.

Switch Adjusting Wrenches are of a high forged steel, designed specifically for railroad use. Their wide jaw widths, and the angle on which they are attached, allow them to overcome the tendency to slip off of the nut.

Safetran Starting Punches are of chisel steel, hardened and annealed for severe service and to prevent chipping.

Safetran's Bond Punches and Extractors are made of hardened chisel steel, hardened and gauged at the punch end for severe service.

Safetran Switch Point Clamp is a device that can be applied to a switch point to temporarily lock a switch in a desired position.

Safetran Semaphore Oil, supplied in one quart containers, serves where a light-weight high quality lubricating oil is required.

Safetran No Oxide Grease, supplied in a one pound container, is a general purpose lubricant that provides a protective anti-rust coating as it lubricates.

Safetran's low temperature gear grease has a wide temperature range from -100° to +300°F. This low temperature gear grease is recommended for use in the model S-Gate.

MISCELLANEOUS TOOLS AND LUBRICANTS ORDERING INFORMATION

To Order: Specify Description and Part Number.

Description	Part Number
Cable Sheath Cutter	032100-X
Replacement Blade Unit for Cable Sheath Cutter	032101-X
Model M Switch Obstruction Gauge, 4" Handle (1/8", 3/16", 1/4", 3/8", 1/2")	032643-1X*
Model M Switch Obstruction Gauge, 1-3/4" Handle (1/8", 3/16", 1/4", 3/8", 1/2")	032643-3X*
Model L Switch Obstruction Gauge (1/4", 3/8", 1/2", 5/8")	032643-500X
Model L Switch Obstruction Gauge (3/16", 1/4")	032643-508X
Switch Adjusting Wrench, 1-5/16"/1-11/16" opening, 19" in length	032249-1
Switch Adjusting Wrench, 2-7/16" opening, 19-1/2" in length	032249-2
Switch Adjusting Wrench, 1-1/2" opening, 19" in length	032249-3
Switch Adjusting Wrench, 2-1/16" opening, 19-1/2" in length	032249-4
Starting Punch (.170" to .175" Diameter Nose)	080600-7
Starting Punch (.255" to .260" Diameter Nose)	080305-2
Starting Punch (.326" to .331" Diameter Nose)	080305-1
Installation Punch 900 Bond	080900-7
Bond Removal Punch 900 Bond	080901-1
Bond Extractor	080341
Switch Point Clamp	110349-1X
Semaphore Oil, One Quart	032400-X
No Oxide Grease, One Pound	032401-X
Low Temperature Gear Grease for S Gate	032403-X

*These gauges are furnished with a leather case.

TRANSISTORIZED SPEAKERPHONE

Safetran's transistorized speaker phone is a portable wayside phone used for communication along the track during maintenance. The speaker phone is housed in a sturdy, lightweight plastic case, with a leather handle that allows easy carrying. Conveniently located on the face are the speaker, talk button, on/off volume knob, and connecting wires.

SPECIFICATIONS

Receiving:
Sensitivity: -25 to -30 db

Impedance:
3000 ohms (300 Hz 5KC) increasing above 5KC to 15000 ohms at 30 KC.

Resonant Frequency:
100 Hz Impedance at this frequency is 750 ohms and rises rapidly to 3000 ohms either side of 100 Hz.

Audio Power:
200 mW

Transmitting:

Max. Output:
10 db.

Impedance:
600 ohms (300 Hz to 3000 Hz) increasing to 15000 ohms above 3000 Hz.

Frequency Range:
300 Hz to 3000 Hz.

Batteries:
Eight 1.5V AA type or two 6.0V lantern batteries.

Battery Life:
Approx. 125 hrs.

6" high x 4" wide x 3" deep for Models using AA batteries
and
6" high x 4" wide x 6" deep for models using lantern batteries

To Order: Specify Transistorized Speakerphone and Part Number.

Note	Part Number
Speakerphone Uses eight AA batteries	010645-1X
Speakerphone As above except with leather carrying case	010645-2X
Speakerphone Uses two lantern batteries	010645-3X

WAYSIDE SPEAKER PHONE

The Safetran Wayside Speakerphone is designed to replace the wayside phone booth or phone box. All components are housed in a sturdy weatherproof aluminum box. The housing is equipped with hinged door and lock hasp.

The speakerphone is normally disconnected from line. Insertion and 35 degree clockwise rotation of switch key connects speakerphone to line and turns on transistorized amplifier. A further 15 degree spring loaded clockwise rotation of the switch key is used for transmission or a "push-to-talk" button may be used for this purpose.

SPECIFICATIONS

Receiving:
-25 to -35 db

Impedance:
300 ohms (300 Hz to 5KC) increasing above 5KC to 15000 ohms at 30 KC.

Resonant Frequency:
1000 Hz Impedance at this frequency is 750 ohms and rises rapidly to 3000 ohms either side of 100 Hz.

Audio Power:
200 mW.

Dimensions:
Height: 13-1/2 inches
Width: 8-1/2 inches
Depth: 5 inches

Weight:
26 pounds.

Max. Output:
10 db.

Impedance:
600 ohms (300 Hz to 3000 Hz) increasing to 15000 ohms above 3000 Hz.

Frequency Range:
300 Hz to 3000 Hz.

Batteries:
two 6.0 V lantern type batteries.

Battery Life:
estimated 5 years.

ORDERING INFORMATION

To Order: Specify Description, Part Number and Attach Key of your choice for fabrication of lock assembly.

Description	Part Number
Wayside Speakerphone	010645-10AX

Section N

LINE MATERIAL

SECTION N

CONTENTS

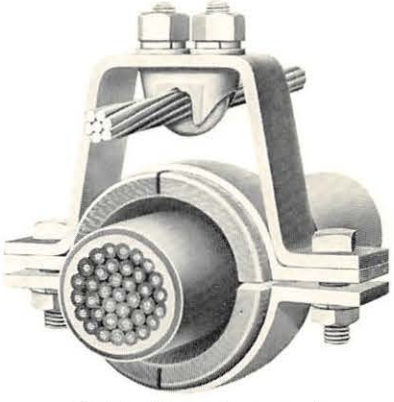
Product	Subsection
Deadends/Cable Straps	1

Safetran

DEADENDS/CABLE STRAPS

Cabling Strap

Single Deadend



Cable Drop Support

Safetran Cabling Straps, capable of supporting 20 pounds of cable per strap, can be furnished with or without hooks for messengers of 1/2 inch diameter or smaller. These hooks, when furnished, are of bronze for steel messenger, or stainless steel with Dacron insert for aluminum messenger.

The Racolene® Cabling Strap has supporting wires of soft annealed copper weld to permit easy forming of strap to cable. The cable strap is insulated by means of an insulated black polyethelene strap slipped over the holding wires.

The Bead Cabling Strap has metallic components identical to those employed in the Racolene® strap. The bead portion is plastic, completely insulating the unit from the messenger.

The Fabric Cabling Strap provides a means of binding together a number of wires in the form of a cable. A flame resistant, self-extinguishing strap of neoprene covered with Dacron is used.

Wherever it is necessary to firmly grip cable to prevent creeping, the Safetran Cable Drop Support is recommended. It is constructed of a galvanized steel frame fitted with a hardwood spool for clamping to cable, and a clip for clamping to messenger.

Safetran Deadends provide a termination point for bare or insulated wires. The insulators; of brown, glazed, dry porcelain, are designed so that they will drop into the eyebolt from one side only and will not fall out while the wires are being attached. Tests made indicate that a pull of 4500 pounds is required to breakdown the porcelain. Compared with the breaking weight of No. 6 hard drawn copper, the insulator provides a factor of safety of nearly 4 to 1. In the event that a procelain insulator does break, the wire is held in place by the eyebolt and does not drop to the ground.

CABLING STRAPS
ORDERING INFORMATION

Racolene® Cabling Strap

Fabric Cabling Strap

Bead Cabling Strap

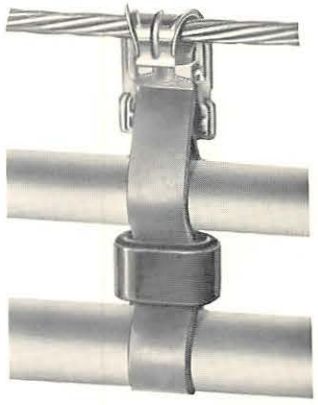
To Order: Specify Cabling Strap Type and Part Number.

Type of Cabling Strap	Cable Diameter In Inches	With Bronze Hook	Part Number With Stainless Steel Hook	Without Hook
Racolene®	1	028611-71X	028611-71AX	028611-101X
Racolene®	1-1/4	028611-72X	028611-72AX	028611-102X
Racolene®	1-1/2	028611-73X	028611-73AX	028611-103X
Racolene®	1-3/4	028611-74X	028611-74AX	028611-104X
Racolene®	2	028611-75X	028611-75AX	028611-105X
Racolene®	2-1/4	028611-76X	028611-76AX	028611-106X
Racolene®	2-1/2	028611-77X	028611-77AX	028611-107X
Racolene®	2-3/4	028611-78X	028611-78AX	028611-108X
Racolene®	3	028611-79X	028611-79AX	028611-109X
Racolene®	3-1/4	028611-80X	028611-80AX	028611-110X
Racolene®	3-1/2	028611-81X	028611-81AX	028611-111X
Racolene®	3-3/4	028611-82X	028611-82AX	028611-112X
Racolene®	4	028611-83X	028611-83AX	028611-113X
Racolene®	4-1/4	028611-84X	028611-84AX	028611-114X
Racolene®	4-1/2	028611-85X	028611-85AX	028611-115X
Racolene®	4-3/4	028611-86X	028611-86AX	028611-116X
Racolene®	5	028611-87X	028611-87AX	028611-117X
Racolene®	5-1/4	028611-88X	028611-88AX	028611-118X
Racolene®	5-1/2	028611-89X	028611-89AX	028611-119X
Racolene®	5-3/4	028611-90X	028611-90AX	028611-120X
Racolene®	6	028611-91X	028611-91AX	028611-121X
Bead	1	028503-11X	028503-11AX	028503-51X
Bead	1-1/2	028503-12X	028503-12AX	028503-52X
Bead	2	028503-13X	028503-13AX	028503-53X
Bead	2-1/2	028503-14X	028503-14AX	028503-54X
Bead	3	028503-15X	028503-15AX	028503-55X
Bead	3-1/2	028503-16X	028503-16AX	028503-56X
Bead	4	028503-17X	028503-17AX	028503-57X
Bead	4-1/2	028503-18X	028503-18AX	028503-58X
Bead	5	028503-19X	028503-19AX	028503-59X
Bead	5-1/2	028503-20X	028503-20AX	028503-60X
Bead	6	028503-21X	028503-21AX	028503-61X
Fabric	1	028219-11X	—	028219-51X
Fabric	1-1/2	028219-12X	—	028219-52X
Fabric	2	028219-13X	—	028219-53X
Fabric	2-1/2	028219-14X	—	028219-54X
Fabric	3	028219-15X	—	028219-55X
Fabric	3-1/2	028219-16X	—	028219-56X
Fabric	4	028219-17X	—	028219-57X
Fabric	4-1/2	028219-18X	—	028219-58X
Fabric	5	028219-19X	—	028219-59X
Fabric	5-1/2	028219-20X	—	028219-60X
Fabric	6	028219-21X	—	028219-61X

MULTIPLE CABLING STRAPS WITH SEPERATORS ORDERING INFORMATION

Racolene® Multiple Cabling Strap

Bead Multiple Cabling Strap

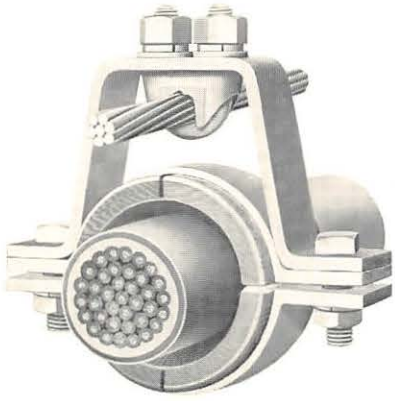


Fabric Multiple Cabling Strap

Multiple Cabling Straps are furnished with appropriate quantity and size of porcelain seperators required for each specific application.

To Order, specify type of Multiple Cabling Strap and outside diameter of each cable to be supported.

CABLE DROP SUPPORT ORDERING INFORMATION



To Order: Specify Description and Part Number.

Description	Cable Diameter In Inches	Part Number
Cable Drop Support with Clip for 5/8″ Messenger	7/16-3-1/4	028304-9X
Cable Drop Support with Clip for 3/8″-1/2″ Messenger	7/16-3-1/4	028304-10X
Cable Drop Support without Clip	7/16-3-1/4	028304-16X

DEADENDS
ORDERING INFORMATION

Single Deadend

Double Deadend

Anchor

Eyebolt Deadend

Insulator

To Order: Specify Description and Part Number.

Description	Part Number
Single Deadend (includes one Insulator)	028239-12X
Double Deadend (includes two Insulators)	028239-13X
Anchor	028239-7X
Eyebolt Deadend (includes one Insulator)	028158-2X
Porcelain Insulator (for all Deadends)	028149-2